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Editors

Leslie Moller, Ph.D.
Department of Technology and Cognition
University of North Texas

Greg Jones, Ph.D.
Department of Technology and Cognition
University of North Texas

Kaye Shelton
Dallas Baptist University

Introduction

In June 2004, 90 participants from over 5 countries gathered in Denton Texas for the AECT/University of North Texas Summer Conference. The theme of the conference was Emerging Technologies and Theories for Teaching and Learning. In addition to over 50 sessions and workshops the participants shared research, exchanged ideas, networked and enjoyed some Texas hospitality.

The selected proceedings represent some of the best papers presented at the conference.

Leslie Moller
Conference Chair

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Conference Keynote

I remind you of the words of Robert F. Kennedy

> Some men see things as they are and say why? I dream things that never were and say "Why not?"
>
> -

Technology breakthroughs have always held the potential to improve life. However, it is only as we truly seek to understand the vast realm of possibilities available through these breakthroughs, and as we have the courage to utilize that technology in creative, & perhaps controversial ways, that we can even begin to fully realize technology's potential to improve the quality of learning and life. Simply recreating the present in a more efficient manner seems wasteful, especially when the status quo is so ineffective, and the possibilities are so endless. By itself, technology in learning is a benign force. However, when tools and learning strategies are combined and constructed in ways, which expand our potential to learn, we give meaning to that technology.

We have made great strides in increasing access to technology in education; however, accessibility is only half the equation. Technology has an almost unlimited capacity to carry and present information; however, learning is more than receiving and storing information. Information only becomes knowledge when people convert it through application. Human beings are social creatures who traditionally encourage, communicate, and share amongst themselves. It is our challenge and responsibility to find ways to use technology to expand the learning opportunities.

One step towards meeting our responsibilities, as professionals, is to develop a renewed sense of purpose or ethos. I suggest to you approaching the task with a renewed vision that sees the classroom, from the simple one room school house to the ivy – covered university halls, to the virtual classroom as our countries finest cathedrals - where the pursuit of learning and knowledge is worshipped above all else.

In this vision, Learning, the only goal worthy of consideration, is considered an endless process that cannot be neatly packaged, and perhaps never be fully captured or measured.

I know that statement flies in the face of current conventional thinking, but I suggest to you that those who push this simplistic agenda that encourages a numeric "score" do not understand the complexity of education and learning and furthermore they fail to demonstrate the proper respect for professional educators.

As Einstein has said, “"Not everything that can be counted counts, and not everything that counts can be counted”

In this new ethos, change is constant and encouraged. I ask you to consider that any attempt to maintain the status quo, in any guise is failure. We need to find ways to encourage and reward emancipation, independence and innovation. Human have an need to explore and understand what exists beyond their sight. What I suggest to you is that the new frontiers now are not only a geographic destination but also intellectual. The treasures we seek are not of natural resources but of thought, wisdom and understanding.

To achieve our renewed learning endeavors we need to impose an internal discipline which seeks to actively support any idea or tool that has the potential to improve learning while simultaneously rejecting those, perhaps suffering from an ethical lapse or simple ignorance, seek to promote a technology that offers little beyond the flash and hype. While some may view that as harsh, the pursuit of excellence requires critical examination and tough choices.

In the pursuit of building our great cathedrals of learning we need to stand together to reject the notion that efficiency is more important that effectiveness and raise rather than lower the expectations of what our students and schools can produce. Throughout the history of the world, great advancement were never realized by pessimists.

Each of us are leaders, and as such, carry the responsibility to be optimistic about the potential of each and every student.

I applaud you for your time and efforts to improve your professional skills. By your participation here you must share in my belief that instructional technologies offer great promise and potential. We will always have emerging ideas and technologies; it is a never ending cycle. However, there is no profession that is more honorable than being an educator and no task more important that improving the teaching and learning process. I suggest to you though, the secret of all our future major successes will not be the learning theories or technologies by themselves, it will be our commitment to realize an educational vision based on one simple premise nothing is more important that learning.

In closing,

> All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."
>
> - Arthur Schopenhauer (1788-1860)

Les Moller, Ph.D.

Technology as a Vehicle for Institutional Change

Lee Allen
Division Manager, Business Systems
Dallas Independent School District

Abstract

The Dallas Independent School District (DISD) has recently undergone dramatic changes in migrating from legacy business technology systems to the implementation of an Enterprise Resource Planning (ERP) Finance and Human Resources system. The change management, communication, and training components of the implementation were challenging in both complexity and depth. The timing and total level of effort required for any component could not be readily identified without an assessment of change readiness in the organization. To better determine the change management practices required for the project to succeed, the DISD initiated an analysis of its organization and people. Using the results of this analysis, DISD developed a customized change management plan to address the technological and procedural needs of the district.

Introduction

In the world of the large corporations and manufacturers conducting business globally, a common practice is for management to determine a method of consolidating all financial and human resource transactions under one central database and software application solution. These software and hardware configurations are referred to as Enterprise Resource Planning (ERP), an “industry term used to describe a broad set of activities supported by multi-module application software” (Alexandrou, 2003) that helps a business or organization manage the important aspects of its business. The deployment of a large-scale ERP system involves considerable business process analysis, employee retraining, and the establishment of new work procedures. ERP systems, such as those offered by Oracle, SAP, and PeopleSoft, are notoriously complex, as installing the software often forces users to change internal processes (Computerworld, 1998).

Large-scale ERP implementations are expensive, require a substantial installation period (six months to two years, typically), and an even longer period of time must be allowed for employees to make necessary adjustments and to overcome technical glitches. Because of these daunting demands, public sector (governmental) institutions and, especially, public school districts have traditionally been slow in adopting ERP solutions, due to time, cost, and the resistance to change from systems (Wheeler, 2003). Essentially, if the legacy systems, no matter how antiquated, perform at a minimally acceptable level for the tasks required, the institutions stay with those systems (Kongshem, 1999). However, a buzzword frequently heard in governmental and, particularly, educational administrative circles these days is *accountability*. With increasingly tighter budgets and further restrictions on spending, the need for careful scrutiny of every dollar allocated has become a critical need (Liddle, 2000). This need is conveyed to all public sectors. For example, in the case of educational institutions, and

particularly public school districts, the No Child Left Behind Act of 2001 has added further scrutiny of school budgeting practices and may lead to the eventual requirement of funding accountability down to the individual student level.

As the demands for fiscal and academic accountability begin to merge, the concept of a centralized database supporting interconnected software applications suddenly seems to be a more viable solution, despite the time and cost factors (Frantz, Southerland, & Johnson, 2002). While public school districts are not quite scrambling to create Requests For Proposals (RFP) from the major ERP solution providers, several large school districts have recently made the transition into the world formerly reserved for major corporations and manufacturers.

The Dallas Independent School District (DISD) is one of the districts that have become an early adopter and thus a beta site for the analysis of the success – or lack of success – in implementing an ERP solution in a large school district. The DISD has undergone dramatic change in migrating from antiquated legacy business systems to the implementation of a new Financial and Human Resources ERP system. The magnitude of the change is significant, encompassing such transformations as organizational restructuring, the introduction of new methodologies and procedures, and the implementation of new technologies. In businesses, these types of periodic changes are critical to improving organizational effectiveness and efficiency, and ultimately lead to financial success (Drucker, 1999). It is generally acknowledged that in order for such changes to be successful, the *people* within the organization must be able, willing and ready to accept them (Senge et al. 1999).

People are often resistant to changes in the work environment they are accustomed to for a variety of reasons:

1) Lack of understanding of the meaning and reasons behind the change;
2) Lack of preparation in new knowledge, skills, and abilities;
3) Difficulty in disconnecting from past habits and activities; and
4) Fear of loss and instability. (Gibson, Holland, & Light, 1999)

In many cases reluctance to change in adopting new technologies results from a poor understanding of requirements needed to prepare individuals for change and the execution on change readiness activities designed to reduce disruptions brought about by change (Robinson & Dilts, 1999). A drop in productivity can be expected during periods of transition and uncertainty (Appleton, 1997). This is often due to the failure on the organization's part to assess organizational risk factors and key enablers of change, and to adequately prepare individuals for technical and organizational transformation (Peters, 1987). The change management approach used by the district involved identifying the issues that had the greatest impact on the employees due to anticipated changes, and the development and implementation of strategies to resolve those issues. Real, sustainable change requires effecting change in every level of the organization - leadership groups, individuals, and the organization as a whole (Northouse, 2001). Change management involves such principles as developing or realigning the leadership team, designing systems to support change objectives,

assisting individuals in learning new skills or mind-sets, and creating new human resource and performance measurement processes and models (Boudreau, 1999). Change management principles were incorporated in all facets of the ERP implementation so as to facilitate and achieve the district's goals of organizational change at the employee level.

Statement of the Problem

The deployment of a large-scale ERP system involves considerable business process analysis and redesign, employee retraining, and new work procedures, as introducing the new technology often forces users to change their internal business processes. The main issues revolve around to what extent does the introduction and use of new technology contribute towards implementing procedural changes in a public sector organization, what is the level of user acceptance and satisfaction with a new technology in the implementation of an ERP system in a public sector organization, and what are the perceptions of the user community in terms of individual attitudes towards the introduction and use of a new technology.

This paper analyzes such an implementation and the outcomes as measured by the employees' perception of business process changes and how they were affected, user acceptance of- and comfort level with- new technologies, and the overall success of the implementation from a user's viewpoint.

Background

The Dallas Independent School District (DISD) is located in Dallas, Texas. Current student enrollment is approximately 165,000, with approximately 22,000 employees consisting of teachers and support staff (administrative, curriculum, IT, and facilities maintenance). Since 1999, an initiative to replace outdated legacy computer systems for financial and human resource processes has been underway. Utilizing appropriate state and institutional criteria to identify qualified providers, the DISD replaced its legacy systems with an ERP solution. Oracle is a known quantity among ERP providers (Gibson, Holland, & Light, 1999), and IBM Global Services was selected to provide consulting services to assist in the implementation of the ERP Financials and Human Resources applications, and database.

Purpose of the Paper

The purpose of this paper is to analyze the outcomes of implementing a business model ERP solution in a K-12 public school district's administrative environment. Enterprise Resource Planning (ERP) software can be described as a broad set of activities supported by multi-module software applications automating finance and human resource systems (Alexandrou, 2003). *Fig. 1*

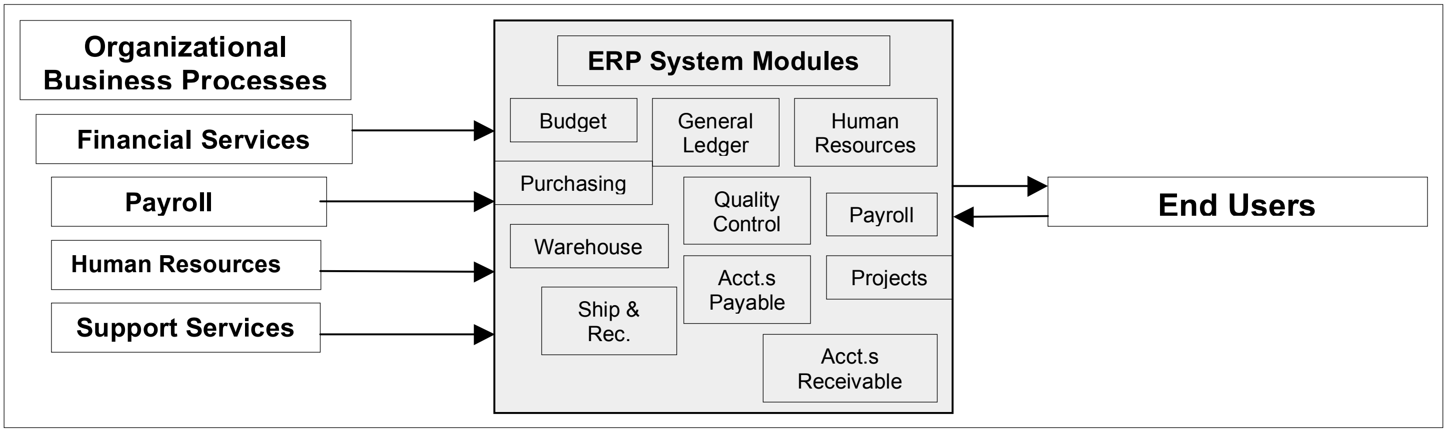

Fig. 1

A primary objective of this paper is to discuss the attitudes and issues that arise from an individual employee's perspective due to the changes and the implementation of new processes and technologies inherent in an ERP conversion (Robey, Ross, & Boudreau, 2000). The paper also attempts to review organizational issues concerning the district's IT infrastructure and processes which could have an impact on the successful completion of the project (Kræmmergaard, Møller, & Boer, 2001).

Most elements of an organization-wide business and technological change implementation can be identified as falling into the category of "structural and behavioral enablers" (IBM, 2002) because through such enablers behaviors can be affected. Enablers exist in the form of organizational programs, practices, systems, tools, or technologies that allow the structure to function as intended and/or promote desired types of behaviors (Lewis, 1995). Enablers can be found at all organization levels, and are most effective when part of an integrated system. The organizational goals that are defined and measured at the divisional level should be reflected in departmental or team requirements and, ultimately, translated into individual performance targets (Allen & Kutnick, 2002). It was thus very important to identify those enabling factors early in the ERP implementation so as to reinforce and support those elements in attempting to enhance the successful outcome of significant change in the district.

Research Questions

The deployment of a large-scale ERP system involves considerable business process analysis and redesign, employee retraining, and new work procedures, as introducing the new technology often forces users to change their internal business processes. An evaluative study can analyze such an implementation and the outcomes as measured by the employees' perception of business process changes and how they were affected, user acceptance of- and comfort level with- new technologies, and the overall success of the implementation from a user's viewpoint. Towards this end, the researcher asks the following questions:

1. To what extent does the introduction and use of new technology contribute towards implementing procedural changes in a public sector organization?
2. What is the level of user acceptance and satisfaction with a new technology in the implementation of an ERP system in a public sector organization?
3. What is the perception of the user community in terms of individual attitudes towards the introduction and use of a new technology?

Significance of the Research

With issues of increased fiscal accountability driving decisions for public institutions to implement centralized databases and software applications, school districts are now in a position to work with the key players in the Enterprise Resource Planning business arena. This is decidedly new territory for most public school districts, as most efforts to work with industry practices in technology have traditionally been specifically targeted, piecemeal installations of a particular type of hardware or software for singular purposes (e.g., student databases). A large-scale migration from legacy systems to an ERP system is a recent development with relatively few large school districts willing to commit to such drastic expense and system overhaul (Wheeler, 2003).

The significance is in the organization's understanding the employees' perceptions of the changes taking place because this perception (and perception is often "reality") plays a critical role in the ERP implementation and the ongoing success, post-implementation. To ensure communication, coordination, and collaboration during the seventeen-month ERP implementation, DISD and its consultants worked closely and cooperatively as a team on the implementation. This team approach was intended to foster a deeper understanding of the implementation, with DISD resources working alongside consultants accustomed to corporate clients. This “marriage” between public and private sector financial, human resources, information technology, and administrative staff is uncommon, as institutional bureaucracies and corporate entities typically work in completely different environments, with significantly different goals (Streiffer, 1999). One has the corporate “bottom line” as its goal (i.e., making a profit), while the mission for education typically centers on insuring that all eligible students attend and graduate from school, and thus be able to lead productive lives, making positive contributions to society in general.

Although very different at a superficial level, the similarities are significant when the idea of Return On Investment (ROI) is included. Unlike corporations, who have shareholders to hold executives accountable, public school districts are supported by a group of shareholders larger than even the largest of companies – the federal, state, and local taxpayers. Thus, the continued, monitored stewardship of the expenditure of those dollars is a mandate for accountability at all levels of a bureaucracy (Bushweller, 2000).

With this stewardship in mind, the change management strategy that accompanied the $30.3 million migration of financial, HR and IT data and processes were critical to the implementation. Without such a plan, the implementation would certainly not have been successful on many levels, as previous failed attempts at

change in the district indicate. The change management, communication, and training components of the implementation were staggering in their complexity and depth, as were the changes in business practices and culture. In recent years, corporations have widely accepted the concept that the management of change is a requirement in the realization of process reengineering and system development (Kanter, 2001). The question becomes how such a concept is carried out in the public sector, and specifically a large school district unaccustomed to change (Deal & Peterson, 1999).

Conceptual Framework

The framework is based on the concept that a large taxpayer-funded institution can undergo a massive technological and business process change effort so long as the change readiness for the organization is measured in appropriate depth (Frantz, Southerland, & Johnson, 2002). While there are anticipated outcomes for a change management effort, the timing and full level of effort required for any given component are not fully known in advance of an assessment of change readiness and technological preparedness (Parr & Shanks, 2000). Rather than having a pre-defined change management implementation plan, a study was developed to begin an analysis of the organization and its people. Using the results of this analysis, DISD developed a tailored change management plan that addressed the specific needs of the district.

Much research has been done in the specific subject matter of organizational change readiness and change management, and a veritable plethora of material is available under this extremely broad category. However, change readiness and change management as it affects a large K-12 public education environment is a subject not explored in abundance, possibly due to the reluctance of many school districts to embrace long range ERP models as have large corporate entities in the private sector (Streifer, 1999). The available research suggests that employees in public school districts often feel powerless to affect change within their own working parameters so are thus suspicious of major change in their existing environments (Barth, 1990). Some research also indicates that the introduction of advanced technological systems may appear threatening in a work environment bound in more traditional paper-and-pencil accounting, and is thus reflected in the organization's human resources' unwillingness to accept change, to the point of sabotaging potential change initiatives from within (Deal & Kennedy, 1999).

Some of the literature found to be most useful in these regards is that rooted in the development of evaluative inquiry as regards organizational development (Preskill & Torres, 1999), approaching organizational learning and change as ongoing and not as "episodic or event-driven, as are many evaluations and organization development interventions" (p.184).

In developing the district's change plan, consideration was given to the impact of the changes, and particularly the *perceived* impact, on individuals, departments, leaders and the organization as a whole. Accounting for the new job roles, behaviors, capabilities, and skills that would be required post-implementation, the potential sources of resistance from individuals, groups and organizations had to be gauged. In

anticipating technical retraining and support needs, training enrollment strategies had to be defined to facilitate individual and organizational transition. To ensure individual and organizational buy-in, the best methods of communicating the future processes had to be identified so as to minimize rumormongering and anxiety over the coming changes (Senge, et al. 2001).

Through the effective analysis of change readiness and technical preparedness, the district anticipated realizing the increased probability that the implementation would achieve objectives and targets on schedule. Leadership groups that understand their special role in leading the change effort had to be developed to ensure that high performance work teams became agents of change, and that employees who remained focused were rewarded for achieving desired results. Organizational structures and systems had to be established to support and reinforce the use of ERP technology in the achievement of desired business results. Other desired outcomes of the implementation included preparing employees to be fully capable of exploiting the benefits of the business processes and ERP technology in the shortest possible time and, ultimately, the smooth transition into full implementation on the “go live” dates.

Summary

The ultimate purpose of the organizational change plan developed was to help identify and reduce resistance to change and help employees to become accustomed to new environments. The district used three basic levers to facilitate change, information sharing, and the likelihood of successful transformation outcomes: (a) a supportive pre-existing organizational structure, (b) identified structural and behavioral enablers, and (c) consistent, reasonably predictable organizational behaviors.

The key elements of a successful change management plan must include commitment from leadership, a common vision, a sense of urgency, a well-established system of timely communications, broad based activities and strategies, visible improvements in the form of attainable benchmarks and milestones, and an acknowledged sense of participation based on teamwork, mutual respect, and trust (El Sayed, 2002).

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PDAs: Solution or Sensation?

Sherri Brogdon
University of North Texas
sherri.brogdon@burkburnettisd.org

"The arrival of another generation of technology, the handheld computers, raises skeptical questions about the potential impact (on education) of these powerful tools: given our poor track record, why should anyone believe the technology enthusiasts?" (Norris & Soloway, in press-b). And if all current education woes could be solved with the use of technology, it would have already been done. But technology can have an impact on education, because education is a continually evolving process and is influenced by technical and philosophical changes over time. How many times have the educational leaders started in one direction, changed direction in mid-stream, only to end up where they started, with the rest of us in tow? It can be a maddening cycle of research-driven best guesses. The need for change in education is directly linked to changes in the world around us, thus the goal of the educational process should be to teach students how to succeed in a world that is continually changing, to become independent thinkers, and to apply the knowledge attained through their education to new situations. To quote Albert Einstein, "If a person has learnt to think and to work in an independent way, he will be able to adapt himself to changes more than a person who has learnt a specific skill" (Verri, 2003). Sometimes the objective of learning is lost in the hoopla surrounding the education community, i.e. the impact of technology or the teaching strategies brought about by new testing practices. The one thing that will remain the same is that education will change, which means everyone involved must continually learn in order to keep up with those changes. In a recent speech, Tom Carroll, Director of Preparing Tomorrow's Teachers to Use Technology, U.S. Department of Education, capitalizes on the concept of lifelong learning and proclaims that in today's schools we must all be learners (Carroll & Witherspoon, 2002). If teachers quit learning, they are not as effective; if administrators become satisfied, we're all in trouble; but if students do not learn, the entire process has failed. This concept is summed up by a famous quote from Richard Henry Dann, "He who dares to teach must never cease to learn" (Famous Quotes, 2003). While learning, we should be enabled to use the best and most current tools available, so that we become as efficient and creative as possible. Technological innovations are among the current tools of which educators should be able to take advantage.

Some argue that technology is distracting our young people from truly learning and using critical thinking skills (Rogers, 2003). According to the International Technology Education Association (ITEA), the definition of technology is "any human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities" (International Technology Education Association, 2000). Under this definition, the invention of the wheel and the discovery of electricity are also technological innovations, and these technologies have made us more efficient and capable than ever before. If used properly, technology makes our lives better; therefore, it seems that using technology appropriately in education would benefit students, teachers, and society. How can we, as educators, create independent learners who can adapt to any situation, if we don't prepare them using the tools at their disposal in the real world? This lack of preparation would truly be a disservice to our students, who are already just middle of the road academically compared to

students from other nations. "In a recent survey of eighth grade students from 38 industrialized nations, the United States scored 18th in science and 19th in mathematics" (CEO Forum on Education and Technology, 2001).

There must be changes made in the methods used in education. Technology not only helps us become more efficient and capable, found Norris and Soloway (in press-a), but also can help raise student achievement.

> Technology use has been proved effective in education under the following circumstances:
>
> - Sufficient access to technology
> - Adequate teacher preparation
> - Effective curriculum
> - Relevant assessment
> - Supportive school / district administration
> - And supportive family and community.
>
> The range of impacts include: increased time on task, higher tests scores, lower costs, and increased motivation" (Norris, Soloway, in press-a ¶ 2).

There are many specific examples of technology's impact on student achievement. In 1998, the Pinellas County, Florida, school district identified that almost one-quarter of their high school students could not read their textbooks. The county invested in a multimedia reading program, teacher professional development, doubled class time, and divided class sizes in half. The technology not only engaged and motivated the students, but one teacher , whose tenth grade students began at a fourth grade level, saw an average of one grade level increase each semester. Similarly, other research conducted by the Educational Testing Service in an eighth grade math class resulted in students gaining one-third grade level increase when computers were appropriately used to apply higher-order thinking concepts (CEO, 2001). Appropriate use of technology takes into consideration five "building blocks" for student achievement on which the CEO Forum built their June of 2001 report: assessment, alignment, accountability, access, and analysis. "Our national emphasis should shift from whether or not technology should be used in education to how it should be applied to achieve these educational objectives" (CEO, 2001).

According to the International Society for Technology in Education (ISTE), the national standards to technology integration for students should follow six broad topics: 1) basic operations and concepts, 2) social, ethical, and human issues, 3) technology productivity tools, 4) technology communication tools, 5) technology research tools, and 6) technology problem-solving and decision-making tools. These categories should be used to link performance indicators to the standards (ISTE NETS, 2002). But again, these are standards for using the tools of technology, just as the TAKS test in Texas should be used to assess knowledge learned. Neither should be taught as an end in and of itself. "Some people look at technology and think about how it can be used. A better approach would be to look at how people work and use information and then look for software or hardware which will help them to interact better with that information" (Pownell & Bailey, 2000) There are several barriers to providing appropriate

technology in an educational setting. One of the barriers to technology use is lack of access, once called the digital divide. A few years ago, the most common definition of the digital divide was "the gap between those individuals and communities that have, and do not have, access to the information technologies that are transforming our lives" (Dickard & Schneider, 2002). Currently a second-generation divide is being defined as a gap between those with, and those without, enough bandwidth to use many modern multimedia resources (Dickard & Schneider, 2002). Whatever the definition, without access, technology can have no impact on education. According to Snapshot Surveys, a multidimensional survey given to teachers across the United States, "the strongest predictors of teachers' technology use were measures of technology access. Conversely, and contrary to conventional wisdom, teacher characteristics and demographics were of relatively little consequence in predicting technology use" (Norris, Sullivan, Poirot, & Soloway, 2003). Further statistics showed that sixty percent of teachers have one or fewer computers in their classroom, and sixty-five percent of teachers have access to a computer lab one time a week or less (Norris& Soloway, in press-a). Another study, describing how full time secondary teachers were incorporating the use of computers, found that teachers used their computers primarily for documentation of grades, and the Internet was mainly used for searching out instructional materials. Students in all classrooms were allowed very little time on the computer, and teachers did not use them for instructional purposes (Wilson, 2003). Other barriers exist, such as time, funding, training, leadership, and technical support, but the greatest barrier to appropriate technology integration and application, according to the 4,000 teachers included in the survey, is lack of access. "As long as the computer lab is down the hallway and up the stairs, teachers will consider them irrelevant to learning and teaching. As long as the ratio of students to computers is 4/5/6/7:1, the effort needed to use them is simply too high, given all that has to be accomplished already in a school day (Soloway, et al., 2003).

How can this problem be solved when all government agencies are cutting back on their funding of technology in education? Instead of giving students personal access to a computer, which is much more powerful than most students or teachers will use in a classroom setting, one solution could be to give the students the essentials by way of a more affordable alternative: the PDA or personal digital assistant, also referred to as a handheld. On a continuous basis, most students need to be able to digitize text to be used in projects, use spreadsheets in experiments, use collaborative mapping strategies for organizing group work and brainstorming, make presentations, and conduct research on the Internet. There are other curriculum specific tasks that would be a welcome enhancement to curriculum but would not be necessary on a continuous basis. As a middle school teacher, I find it very difficult to allow my students to use technology for projects, when I have only one computer in the classroom. In a recent Health project, my classes were required to do research in the library on six Internet-connected computers; instead of taking one day to do the research with each student getting the full 45 minutes of time to search, each student could use only 30 minutes on a rotating basis over 3 days. The second cog in the educational process was getting all of the creative writing assignments into a digital format to be used in projects, such as newsletters and childrens' books. It took at least two weeks for all papers to be typed, either at home or at school. This was a huge organizational problem because it takes about three class periods for the average eighth grader to type a two-page paper, and there were only five computers to use at school. There was no lab access, so another teacher offered the use of two computers in her classroom. This, of course, disrupted her class, since my students had to come and go during the period. We spent so much time trying to get the

information into a digital format, the students and I were dragging our feet into the project phase, which should have been the most motivating and useful for developing higher order thinking skills. An alternative form of technology that would allow typing of text and researching on the Internet would have been a lifesaver and a time saver for this project. We must find a way to accomplish the goals of the "No Child Left Behind" legislation, which states that Title II goals include:

- To improve student academic achievement through the use of technology in elementary schools and secondary schools.
- To assist every student in crossing the digital divide by ensuring that every student is technology literate by the time the student finishes the eighth grade.
- To encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices by State education agencies and local education agencies (Texas Education Agency, n.d.).

Handheld computers would be a viable solution to the immediate need for technology access to increase student achievement.

David Pownell and Gerald Bailey (2001) state that handheld computers are the next machines that will "change the face of our everyday lives." Why will this machine make a difference in education when so many previous technological innovations have failed? The handheld has four characteristics that set it apart from desktop "personal" computers. These characteristics are portability, accessibility, mobility, and adaptability (Pownell & Bailey, 2000). Before explaining how each of these can change the landscape of education, I must add one more to the list, maybe the most important for education; affordability.

The most obvious asset of handhelds is its portability. It is a prime example of technology's increased processing power in an "itty bitty living space" (Walt Disney Classics, 1996). The size of handhelds has gone through some major transitions in its short history. Beginning in 1993 as the Apple Newton, it was about the size of a brick and was the butt of many jokes. In 1996, Jeff Hawkins, inspiration behind the Palm Pilot, set the standard for size to that of a shirt pocket. He said it was defeating the purpose of a handheld for them to be larger. In 1997, the Handheld PC Pro, "also heralded as a PDA-on-steroids," was introduced; later to be resized and marketed as the Pocket PC (Cain, 2003). The handheld's portability means that users can take important information with them instead of "being tethered to stationary computers;" now the technology goes with us instead of having to go to the technology (Pownell & Bailey, 2000). In education, that means students are able to take the technology with them on field trips, such as at Calcasieu Parish Pubic School in Lake Charles, Louisiana. The seventh and eighth graders at this school used their handhelds during a Forensic Science unit. They recorded observations and data as they learned about evidence gathering, and they took the computers on a field trip where they used a program called Sketchy to "draw the crime scene." They also were able to enter data on a template that was created using Documents to Go (Palm One Education Snapshots, 2003). As can be seen from the examples, this technology is task-oriented; its not about learning the technology.

The second characteristic, accessibility, refers to the ability to have the information available at any time and anywhere. For example, the medical community uses PDAs to gather patient information at bedside, which is then 'synced' to a personal computer where information is updated in a database. Nurses and doctors use the updated information for making life-altering decisions (Hassett, 2002). Another example of accessibility is the pilot test being conducted at the Tate Modern, a London museum. The handhelds are being used with a wireless network to enhance museum tours while being tested for audience appeal. This pilot program gives visitors several interactive applications, including: taking surveys, which record visitor's opinions of a certain painting, both before and after seeing a video of its production; creating soundtracks to accompany viewing collages; tracking visitors; allowing the visitors to email information to their home email address; and giving specific tour content dependent on the location of the visitor. All of these enhancements will hopefully make exhibits "come alive" for visitors (Proctor & Tellis, 2003). In education, accessibility is a constant problem for various reasons: some teachers don't have a regular classroom, most teachers have to take work home with them, and there are always meetings with parents, students, or others away from the classroom. Because of their frequent trips with students, coaches are a great example of those needing access to important information anytime and anywhere. They need emergency contact information, personal phone numbers, and medical histories on each student in their care during school-sponsored trips. Handhelds have helped alleviate this type of administration problem at Paideia Schools, where current student information is downloaded once a week by 'syncing' to the school's intranet (The Paideia School, 2003). If students are allowed use of their PDAs after school hours, they would also benefit from being able to look up notes taken in class, due dates for projects, or reminders of after school activities, supply lists, etc. Increased organization skills would definitely improve student achievement.

Mobility, the third characteristic, refers to the portability of the device, and for education, has the same advantages. Because the small size allows mobility, students and teachers can take advantage of having them at all times. In Maine, a physical fitness class used a program called GenPE on their handhelds to enter results of testing in areas of strength, cardiovascular fitness, and flexibility. (If you've never had the pleasure of trying to keep up with papers on every student, time a mile without a track, and write down results as they finish their mile run, the efficiency and stress relief of using this type of system would be greatly underestimated.) The results of the testing contained on the PDAs are beamed to the teacher, who stores them in a database to compare with fitness standards. "This small, mobile, and versatile technology enables new forms of teaching and learning," says Deb Pluck, who trains teachers at the University of Maine (Palm One Education Study 25, 2003). Of course, the ultimate goal is to increase physical activity and fitness for all K-12 students throughout Maine.

Adaptability, the fourth characteristic, refers to the use of the handheld in various situations. As we begin to take advantage of the opportunities for using these small wonders, we will see even more software available that will increase its adaptability. Just as the Internet has changed the way we receive information, the handheld is changing the way we access it. Special needs students in Marysville, Kansas High School use handhelds to keep their schedules straight and remember their social security number and locker combination. It also helps them with note taking because many of the students can't write legibly enough for even them to read it. These

students also use the handhelds as a graphing calculator in algebra and a stopwatch in P.E. One tool is much easier to keep track of and maintain (Palm One Education Study 3, 2003). In another educational scenario, handhelds were used in a PILOT program conducted by the Texas Education Agency in partnership with the University of Texas Center for Academic and Reading Skills, Region IV Education Service Center, and Wireless Generation, a business partner. The handhelds were used to collect student performance data during the Texas Primary Reading Inventory. Each student was assessed using the portable device, and all data was then uploaded to a secure database on the Internet. The classroom teacher had access to the data after it was aggregated for all students in each classroom. The website also offered various data analysis tools and recommended teaching intervention strategies tied to certain student performance benchmarks (Texas Education Agency, 2003). Other uses of the handhelds in education settings, include: use of a Vernier probe attached to a handheld to collect data inside the classroom or in the field during Biology or Physics lessons, sketching art exhibits and taking notes on a field trip to a museum for Humanities students, using a built-in digital camera to create electronic portfolios, and learning to read music by using a software program called Ebony/Ivory in a keyboarding class. But one of the most creative uses of the handheld is for use in cooperative learning groups. Its infrared port allows students to beam ideas and notes to each other while collaborating on projects.

Previously mentioned software does not even begin to illustrate the many programs being developed for education. Since PDAs were originally created as an organizational tool, the built-in software for keeping calendars, to-do lists, and alerting a person before they miss an important event, can be used to help students become more organized, thus get to class on time with supplies, homework, etc. This skill is badly missing by most middle school and high school students. When addressing problems of student achievement, organization should be addressed first. If a student cannot get to school or class with necessary supplies and work, how are they going to be able to succeed in higher level thinking tasks using the missing work? Digitizing text is the next hurdle over which handhelds can leap. As stated earlier, many of the critical thinking projects need text in a digitized format to be able to use it further. There is a built-in handwriting recognition tool to use, but many feel it is inadequate for keying documents. Once again, Microsoft has come to the rescue with modified versions of Word, Excel, and Powerpoint for use on PDAs. Microsoft does not have the only software for word processing; Hi-CE, an organization that is writing freeware versions for education, has developed a word processing program called Freewrite. Other programs by Hi-CE, include: Go 'N Tell, used to create a virtual scrapbook; Handysheets, used for creating worksheets, quizzes, and surveys; Picomap, used for concept mapping; Flingit, which is used to transfer a web page from a personal computer; Sketchy, an animation and drawing tool; and Cooties, a virus-transfer simulation (Curtis, O'Leary, Bard, Norris, & Soloway, 2003). These programs are just the tip of the iceberg when referring to educational software programs specifically written for PDA use. As we continue to integrate handhelds into the classroom, many more organizations will find it profitable to add to these offerings.

Affordability is the final characteristic drawing educational users to handheld technology. Beginning at $100, which is no more than the cost of a graphing calculator, handhelds are much more affordable than the "personal" computer. "The term personal computer is an oxymoron in K-12 schools. A so-called personal computer is used 8 periods a day, 5 days a week by 8 to 24

different children each period" (Soloway, et al., 2001). There are even classrooms where teachers don't allow anyone else to touch their "personal" computers. Beginning at the basic $100 cost, PDAs have a monochrome screen and about 8 MB of memory. From that starting point, they increase in cost according to the built-in properties. Color screens, more memory, integrated digital cameras, and more program options will raise the price from the basic $100 to about $600, for a PDA / cellular phone combination. The best buy for the dollar, according to consumersearch.com (2003), is the Palm Tungsten E for $199. It includes 32 MB memory, 320x320 resolution screen, weighs only 4.3 ounces, and has an SD card slot for expansion. Buying a $79 wireless portable keyboard is also a necessity for a PDA that will be used to type long documents (Norris & Soloway, in press-b).

To give a complete picture, there must be mention of the limitations of PDAs. For some of the same reasons that the handheld is good for education, it also makes it easier for students to steal and cheat. Teachers who have taught in math classrooms or technology labs know there is a certain amount of expertise the teachers and administrators must gain in order to make sure that these offenses do not take place. In math classrooms, the use of graphing calculators is a necessity, so the teachers have a method for making sure all the hardware is put back before the end of the period. Serial numbers and other ways of identifying school property, including high tech methods, also need to be used. As far as cheating is concerned, most technology teachers are able to catch student infractions, if they are paying attention to the students during class or to assignments they turn in. If the PDA is used for critical thinking exercises instead of question and answer sessions, cheating is easier to spot and less likely to take place. Another limitation mentioned is that of the PDA being a distraction. Again, if the teacher is paying attention to what is transpiring in the classroom, the distraction can be removed, just as it is if students are caught writing notes during class. Rules will have to be made, and many are already in place to discipline those students who cause problems. Many of these students already break the current rules, and if used correctly, maybe we can use PDAs to motivate and divert their attention to actually learning. There are other limitations of a physical nature, which include: screen size, some find this to be a deterrent to using the PDA; and the miniscule keyboard, which is too small for typing long documents.

Advantages of using handhelds in education far outweigh the limitations. They are simple to use, ready-at-hand, and can be turned on and off immediately to allow for lecture time without distraction. They are also task-oriented and teacher-friendly, not requiring teachers to change the way they teach. An analogy by Norris and Soloway (in press-a) insists, "When one looks at a clock on the wall, one does not see a round object with two lines with numbers painted on, etc. Rather, one sees the time. The tool is invisible.... Rather than being confronted with excessive menu bars, icons, and pull-down lists, handhelds, with their limited functionality, help children to focus on the task at hand, and not get lost in figuring out how to use the tool." There is one last comment to make on the advantage of using handhelds; they're fun, and who says learning can't be fun? Elliot Soloway proposes that since PDAs are of the current generation, just as books were Perry Como's, the students will react to them in a positive way. The media is cutting edge and exciting and will make learning more meaningful and fun for students (Batista, 2001). It follows that student achievement will increase due to the higher motivation and emphasis on developing critical thinking skills using the handheld computers. If the objective in

education is to get student's to think at the levels of analysis, synthesis, and evaluation, the higher levels in Bloom's taxonomy, let's give them the tools to do so.

Of course, none of this is possible without leadership's vision. In Marysville, Kansas, the district superintendent, Randal Bagby, a self-confessed gadget hound, imagines a world of people using PDAs to share information and work anywhere they want. With this vision in mind, he has helped put together classes and generated interest in using handhelds in the educational community in which he works. "He has become a tireless crusader in the handheld revolution" (Palm One Education Study 3, 2001). Not only do administrators have to have the vision, but the classroom teacher must experience the possibilities the new technology can deliver to their students and curriculum. Leaders at every level must have a vision of how the effective use of technologies can help all people become lifelong learners.

In conclusion, PDAs are not the solution to all of education's woes, but it can make a difference in the lives of students, teachers, administrators, and society. As we take advantage of the opportunities afforded us in education by the increase in technological innovation, we must remember that they are just tools; it is up to us, as educators, to use the tools effectively.

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Comparing two type of evaluations of the web-based questionnaire

Chiu-Jung Chen
Rossier School of Education
University of Southern California
chiujunc@usc.edu

Pei-Lin Liu
Educational Technology
University of Northern Colorado
claire_taipei@hotmail.com

Abstract: The research examined the completion ration of two major types of web-based evaluation questionnaires (multimedia verse text only). Developing good web-based evaluation questionnaires increased completion ratio of. The researchers designed and implemented two evaluation instruments which are multimedia and text only web-based questionnaires. The researchers used "foundation of computer" unit in the general computer science textbook as evaluation instrument. The percentage in using multimedia web-based questionnaire is about 70% completion rate, and there are only 60% of subjects completed the text only web-based questionnaire. The information gathered is useful to improve web-based questionnaire models.

Introduction

Student evaluations have long been an important component of the teaching evaluation process in higher education institutions (Marsh, 1987). In most local higher education institutions, students play an important role in the teaching evaluation process (Tak, 1998). Introducing new evaluation technology to the students has presented a challenge to current teachers. Having demonstrated effective we-based evaluation questionnaires, teachers will get better result and completion ratio.

Questionnaires are the most common research methods which are used for structured interviews or surveys. Web-based questionnaire provides easy way to create and increases the response rate. Web-based system has many advantages to minimize teacher's work, such as creating new surveys, modifying the created questionnaires, gathering questionnaire data, and producing useful reports.

However, different kind of web-based questionnaires cause different completion ratio by the same users. For example, students are not be able to finish whole questionnaires because they pay less attention on text only questionnaires and lack patience. The purpose of the study is to exam the completion ratio between the multimedia designed multimedia web-base questionnaires and the text only web-based one. The information gathered is useful to improve web-based questionnaire models.

Methodology

Two evaluation instruments websites which were designed and implemented by the researchers are text only and web-based system combined with graphics. The questionnaires of evaluation instrument are based on a textbook of general computer science. There are 100 students participated this study and separated into two groups (multimedia verse text only).

Subjects have to login to access the website and then they are given evaluation when they are in. During the evaluation period, teacher can login two website to check what percentage of students have completed the exam at any time. The teacher can see the final reports on the website after the specified period is over. All of subjects' using processes are recorded by the system. Access control is mainly to protect duplicated or unauthorized students to login the questionnaires. The only way to access the system is through a login procedure. All of subjects need to type in different usernames and passwords when they login web-based survey. To do an evaluation, subjects finish whole questionnaire for multiple choice questions by clicking on one correct answer in the website. The front-end for system administrator is developed by MS Access. Using Active Server Page (ASP) technology connects front-end web browser and back-end database administration. The back-end data will be stored in database of MS Access and analyzed by SPSS.

Result

Two types of web-based evaluation results collected have been compared in SPSS. Using Text only web-based questionnaire represents about 60% completion rate of fifty students in this group. The percentage in using multimedia web-based questionnaire is about 70% completion rate of other fifty students. There does not seem to be much difference in the attitude of students from different types of web-based evaluation. Results indicated that there is no significant difference between completion rates of text only web-based questionnaire and multimedia one. However, it is true for teacher to get more completion rate using multimedia website than text only one even though there is no statistic significant. As a result, the experience of evaluation two types of web-based questionnaires has not provided strong evidence that the multimedia web-based survey can increase completion ratio better than text only one.

From Training to Development: A professional development model to empower Singapore teachers for engaged learning with technology

Joy Lee-Yap Fui Choon
Professional Development and Consultancy Branch
Educational Technology Division
Ministry Of Education, Singapore

Abstract
This paper describes how the Ministry Of Education, Singapore, is embarking on a new professional development model under the new Masterplan for IT in education, that is aimed at helping teachers to better transfer and sustain the use of newly-acquired ICT knowledge and skills when they design and conduct classroom activities for students to learn curricular content and skills with the help of technology. The goal of the new Masterplan is to make engaged learning, a reform initiated by the North Central Regional Educational Laboratory (NCREL) to promote active and pupil-centred learning, happen in schools. Concomitant to the concept of engaged learning is the belief in the critical role of ICT as a learning tool. Another impetus for the new model is to recognise the need to bolster the effort by providing essential structures and support to help overcome the many obstacles to smooth transfer and sustainability experienced in the five years of the IT Masterplan. The transition can succinctly be represented by the theme "From training to development". The new developmental strategies entail new ways to deliver training, new ways in identifying learners, forging new professional communities and co-opting new 'training' partners and training institutions.

Keywords: Professional development, engaged learning, ICT integration into the curriculum, communities of practice

Rationale for a model for ICT professional development

Under Singapore's first Masterplan for IT in Education, from 1997-2002, most of the 24 000 teachers received 30 – 50 hours of compulsory in-service training in the use of ICT for teaching and learning. The training was provided by the IT Training Branch of the Educational Technology Division (ETD), Ministry of Education which had recruited 60 experienced teachers and Heads of Department (HODs) to act as Senior IT Instructors. The priority of the first Masterplan was to integrate ICT into the curriculum, i.e. having students learn <u>with</u> the computer rather than learn <u>about</u> the computer or learn computer applications. Thus, the focus of the school-based training by the 60 Senior IT Instructors was on pedagogical principles to harness ICT effectively for teaching and learning purposes. It aimed to equip school teachers with the skills to integrate ICT into the school curriculum through lesson demonstrations, modelling and hands-on activities. The training curriculum comprised 6 core modules covering basics on the use of ICT resources, design of IT-based lessons using courseware, open tools and web resources, infusion of thinking skills and cooperative learning strategies into

IT-based lessons, using IT for project work and planning of an effective school IT plan. To facilitate the development of a learner-centred environment, supported by the availability of technology and digital resources, a 10%-30% reduction in curriculum content was instituted in July 1998. This was one system-wide measure to free up time for teachers and students to incorporate ICT within the curriculum, as well as to infuse thinking skills in lessons.

To date, teachers have acquired the basic skills and expertise to use computers as a teaching tool and to select appropriate ICT resources for learning. Teachers are at different stages of ICT integration, with some having moved into innovating and experimenting with emerging learning technologies and new pedagogies. The more innovative teachers have won awards such as the Hewlett-Packard Innovation in IT Award for developing courseware like a multi-user online collaborative game for the learning of Economics concepts and initiating an inter-school collaborative reforestation project where ICT tools were used for data collection and analysis, communication and knowledge building. Such teachers were found to have been very self-motivated by their interest in ICT use in education as found in a small-scale Teacher Development Study conducted by the Educational Technology Division in 2002. A working environment that was supportive or ICT experimentation further catalysed their use of ICT in the classroom. Other external factors such as incentives or training programmes did not seem to have had significant impact. For the majority of teachers, transferring and sustaining what they had learnt from the 30-50 hours of training would require more impetus and support from the school and the system. It is recognized that the approach and strategies employed in order to realize the vision of the new Masterplan (mp2) must necessarily begin with the professional development of teachers with particular attention to the areas of development needs.

The vision of the second Masterplan (mp2) is effective and pervasive use of ICT that will engage pupils in their learning and equip them to create new knowledge and become lifelong learners. The teacher is key to the realization of this vision where with the help of ICT, teachers can assume the new roles of guide, facilitator and co-investigator of their pupils' learning.

The old IT Training Branch has been reorganized into the new Professional Development and Consultancy Branch. The new emphasis is reflected in the replacement of 'training' by 'development' for the work function of organization unit. This reflects the belief and perspective that undergirds the effort to bring about sustained and empowered teaching practice using ICT. More holistic and empowering 'professional development' (PD) has to replace training where the learning is very much directed by the trainer. Hence, the development of a new PD model to drive this new effort.

Approach

The new PD model for the use of ICT in teaching and learning has ETD poised as champion and catalyst for the use of ICT in education functioning in a systemic manner within the larger Training and Development framework for teachers and in tandem with the pre-service teacher training curriculum in the

National Institute of Education (NIE). The Training and Development framework for teachers maps out the roadmap across five levels from induction training to professional milestone training, and considers the different dimensions in terms of professional practice, personal effectiveness, leadership and management, and national education.

The beliefs underlying the model are that:

1. PD is an ongoing process on a continuum that starts from pre-service teacher training through to in-service training and milestone programmes such as the Diploma in Departmental Management for Heads of Departments (HOD)

2. In order to develop teachers to create learning environments that are engaging for their pupils, the PD programmes should model such learning environments so that the learning becomes experiential and deepened. This is where it is critical to 'walk the talk'.

3. Peer influence is a powerful force and in PD as contrasted to training, teachers' belief in the benefits of technology in their practice needs to be addressed. When colleagues model good practices and share success stories of ICT use, much 'telling and selling' is obviated.

4. Teachers as a community of practitioners can synergise and generate new knowledge. With the convenience of online communication tools, such community-building can be further fostered.

5. School leaders especially HODs are the drivers of ICT integration into the curriculum through their leadership and support to teachers. They should have a vision of IT as an empowering integrative tool for teachers and students and are equipped with skills to better manage the professional development of teachers and IT-based resources in schools.

Strategies
Programmes designed for PD should be customized to the needs of the teachers and the curriculum. These programmes should be delivered in a variety of learning modes that will best suit the varying learning styles and learning objectives.

1. Design of engaging PD programmes

   PD programmes should be designed to model engaged learning albeit for adult learners. The goal of engaged learning is to nurture learners who are responsible for their own learning. They are strategic in the learning process, developing and refining learning and problem-solving strategies. They recognize that learning is a social and collective process, hence they collaborate with other learners. Above all, they translate their learning into

a lifelong passion and are energized by learning. An important starting point would be the consideration of how learning and developmental activities are delivered. Multi-modal delivery such as blended (online and face-to-face) workshops, workshop with practicum, onsite handholding, camps and industry attachments, in addition to the conventional modes of workshops, seminars and conferences would be matched with the intended learning experiences for appropriacy. During the course or programme design stage, sample lesson activities are piloted with willing teachers in the classroom so that the usefulness of the PD workshop is ascertained. Expected learning outcomes from the PD workshop include lesson plans and resources which are designed and developed by teacher participants for classroom application and for sharing with other teachers. A significant development is that the engaged learning framework will be introduced at the pre-service teacher training stage at NIE so that the role of ICT and how it is a key enabler to learning is recognised early.

2. Strategic Customisation

Schools and school clusters (groups of 12-13 schools) can request for customized PD activities which will take into consideration the interest, IT competency levels and curriculum needs of the target group of teachers. Such customized PD activities normally entail workshop sessions with teacher participants creating teaching and learning resources for direct application. The workshop dovetails with a Classroom Handholding cycle where the Trainer handholds a teacher to conduct her lesson with the purpose of helping the teacher gain confidence in ICT use. Her HOD will also be involved in the microteaching cycle of Pre-lesson conferencing, Lesson Handholding, and Post-lesson conferencing. This strategy is to familiarize and equip the HODs in supporting and guiding her teachers in future handholding.

3. Capacity-building

Capacity of HODs as leaders to their respective subject teachers in areas such as technology planning and evaluation, integration of ICT in instructional programmes, resource management and staff development is critical to the achievement of the mp2 goals. ETD has worked with the NIE to review and revise the Diploma in Department Management (DDM) course to better align to the approach of the new PD model. All HODs who have to undergo this six-month long leadership course will then become the champions of ICT integration in their respective subject areas as they are in a strategic position to lead, manage, mentor and support their department teachers. Furthermore, they will also have increased capacity to direct technology planning and integration for the whole school.

An important component in the DDM is the Community of Practice (CoP) project where HODs for IT form communities that will include ETD and NIE faculty which are intended as a support structure for professional sharing and knowledge-building. CoPs originates from Wenger (1998) in his proposal of a social theory of learning where communities form to accumulate collective learning into social practices. These CoPs are

hosted on online platforms that will encourage sharing of information and digital resources, reflective discussions on topics and issues of interest to the community and the generation of new ideas and actions to further the use of ICT for teaching and learning.

4. Partner-in-Training Approach (PITA)

One important initiative where customization and capacity-building interplay is in the Partner-in-Training Approach. The aim is to empower HODs or IT champions among teachers to better sustain what the school or school cluster has learnt through the process of customization of learning content and being equipped as 'trainers' to their own target group of 'trainees'. ETD's role would then play the equipping role to the HODs or IT champions who will become Training Partners. These Training Partners will not only be equipped with the knowledge and skills to customize and facilitate ICT training but also be provided with the training resources.

Challenges

The main challenge of this new PD model is to convince all teachers and important stakeholders that this is not a new initiative but an attempt to improve professional development in a systemic manner and to move forward in view of the changing profile of teachers' ICT competencies. Another oft-quoted challenge is time, having enough of it. This is where systemic change comes into play where a new paradigm and new mindsets take over, not add on to the old. However, it is recognized that in the transition period when systemic changes need to be gradually eased in and the old is reluctantly abandoned, there will be problems. Nonetheless, with our teachers' belief that our children need to be empowered to be lifelong learners in a digital world, half the battle has been won.

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Teachers Creating DVDs?

Context and Authors
All the projects presented in this session were created by practicing teachers enrolled at James Madison University, Harrisonburg, VA in a graduate course exploring the design and development of digital media for instruction. The completion of a video project was one of the requirements for earning credit in the course. With only one exception, all of the course participants had no or little previous experience with digital video. Video work was completed using video and computing equipment that could be found in local K-12 school settings.

Projects
All of the projects were to be designed as instructional videos with a real audience identified as the target viewers for the final project. There were no structured limits to the length or content of the project. The designer had to identify another person as a knowledgeable expert of the intended audience to provide formative evaluation as the project was being developed. The final project needed to be in digital form (DVD, digital video file, Video CD, etc.) All projects were presented at the conclusion of the course.

Participant Evaluation
A survey was circulated among the participants enlisting their feedback regarding their experiences with digital video. This survey was distributed 6 months after the conclusion of the course. There were seven persons who responded to the survey.

Question 1: Have you viewed your video project since class session ended?
Yes = 71%   No = 29%
Comments:
- Many interested parties related to the Valley Swim League
- shared it with other 4th and 5 grade teachers in my building

Question 2: Have you used your video project(s) as part of an instructional activity?
Yes = 43%   No = 57%
Indicate how you used the project:
- Steve (college professor) has used it with the ECED Semester III students (science ed). Also, he and I will be using it in a presentation on science process skills/levels of scientific inquiry at the VAECE (VA. Assoc. for Early Childhood Education) conference in March. We've also written a proposal to present on the same topic at a regional NSTA conference next fall.
- Demonstration of video for use with students "science adventure journals" digital video assignment. Teaching techniques learned in class to the students for them to produce their own science video. This is an optional assignment. I have also used the video with my Astronomy club.
- Hope to use the slideshow to recruit volunteers
- as a introduction to the start of the civil war

Question 3: Have you worked on or planned another digital video project since class?

Yes = 86%   No = 14%

Briefly describe project:

- I've compiled video I took at the JMU Young Children's Program for use in my undergraduate classes on child development and early childhood curriculum.
- Putting together a DVD of the Martin Luther King Jr. Day celebration
- planning a time-lapse type video of the putting together of a Technology Classroom
- Two students and I create and produce a “word of the week” TV show that is aired on Fridays and Mondays. We are focusing on demonstrating the meaning of test taking words (ie. compare, evaluate, describe).
- 4^{th} grade is planning to have the students tape themselves and use iMovie to import their movie into a powerpoint to share

Question 4: What advantages do you see of utilizing digital video within instructional activities?

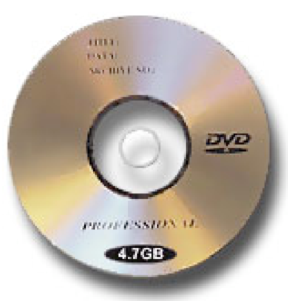
- In my teaching situation, it enables me to focus students on the application of theory and professional literature to the real world of kids and classrooms. I can videotape in their practicum classrooms--students and teachers and settings they know--then use that experience base as a springboard for discussion and analysis.
- student interest
- High impact opprtunities with relative ease.
- allows use of visuals that may not be available otherwise
- It gives purpose to students learning. If they know they will be 'teaching/sharing' their learning with others, students appear to care more and learn the material on a deeper level.
- students are engaged in the activity and learning of the specific material that is interesting to the students

Question 5: What are the barriers you experience in utilizing digital video for instruction?

- TIME…TIME…TIME…and access to the technology to a certain extent. Although it is accessible to me at school, I have so many other obligations during those hours, it's hard to find blocks of time to work on digital projects. If I had the software and hardware at home, I would probably accomplish more.
- equipment, disk space, and time
- None
- equipment compatibility issues; some students may not have access to adequate technology outside of class
- Time to teach the kids to use the editing software. It is hard for teachers to give up class time because of the SOLs.
- computers and the time it takes to complete the iMovie

Free response area

- The course provided experiences with a variety of digital media, as well as support and encouragement for exploring the unfamiliar. I miss the professional opportunity to be involved with this kind of technology "support group."
- My video looks rather amaturish. That is okay since it allows my students to know that digital video is within their grasp.
- Enjoyed learning how teachers on many levels can utilize the technology for the betterment of instruction.
- As digital media continues its conquest of traditional media forms, instructional activities with digital video will become the norm and student involvement in digital video projects will allow for a more collaborative learning environment
- Using iMovie, I am in the process of finishing a living alphabet (one where the children create their letters using their bodies). Soon, I will be working with a fourth grade teacher to create a claymation video of life in Jamestown. Also, our TV crew will begin developing feature news pieces to air on our morning news program. As for next year, my future plans in using digital video are beginning to take shape. I believe I will be working with K-2 next year. I am trying collaborate with those teachers to plan and to create next year's activities. This year I have worked mostly with the upper elementary students. I am excited to see how the medium lends itself to young children.



Teachers indeed can create DVDs and build enough skills and confidence to be able to envision and implement digital video into learning environments. While time is considered a significant barrier to implementation of digital video, the tools are more and more accessible to teachers and learners in K-12 settings. Teachers who feel comfortable with instructional strategies that incorporate project-based and problem-based activities, recognize that increased time needed for design and development of video projects has the potential for increased learning.

Evaluating the Development of a Virtual Learning Network

Randall Davies, Ph.D.
Indiana University

Abstract

Having technology and creating a communication infrastructure are only the beginning steps in the development of an effective online virtual learning network. Effective use and sustainability require much more. This paper and presentation provides details and discussion related to an evaluation of a recently developed online virtual learning network connecting four small rural school corporations.

In less than a decade the internet and related technologies have taken root in our lives. Often the first place many people look for information is the web. The daily proliferation of e-information and new e-learning opportunities is staggering. With recent technology improvements and the decreased cost of technology, schools have begun to explore ways in which technology can enhance learning opportunities and environments (USDOE, 2003). In addition, the No Child Left Behind (NCLB) legislation has placed a required emphasis on technology in all areas of K-12 education, from reading, to science, to special education (ESEA, 2001). As a result, education leaders at the state and local levels are expected to develop plans that effectively employ technology to enhance learning and increase student achievement. For many this includes the establishment of virtual online schools (Clark, 2001). However, in our haste to create and enhance learning though the use of technology, we seem to have forgotten that having technology and creating a communication infrastructure, while essential elements, represent only the beginning steps. Effective implementation and sustainability of a virtual learning environment requires much more. This paper and presentation provides details and discussion related to an evaluation of a recently developed online virtual learning network.

Project Description

The Ripley County Learning Network (RCLN) is an initiative of the Ripley County Community Foundation enabled through a three-year, five million dollar CAPE grant from the Lilly Endowment. The RCLN was established to achieve a "virtual consolidation" of four small rural school corporations. Historically, attempts have been made to consolidate some or all of the four school corporations in order to take advantage of the benefits that a larger school corporation might provide. However, efforts at consolidation have been unsuccessful, due in part to the geographic dispersion of the population across the county and also because the school corporations were not willing to sacrifice small classroom sizes, pride in their history, community based staff and local community control. Yet while the school corporations remained determined to stay physically separate, educational attainment suffered as a result. It was hoped that through a "virtual consolidation", school corporations might maintain their separate status and still benefit from a more diverse curriculum through technologically enabled resource sharing.

The primary goal of the RCLN is to establish the means by which educational resources can be shared among the initiatives partners. The stated vision of the RCLN is to provide all students and educators with the opportunity and ability to enhance their educational experience through access to high quality web-delivered courses and instructional support. RCLN efforts to accomplish this goal have been divided into three main components: technological infrastructure, coordinated curriculum development, faculty professional development.

Evaluation Findings

The RCLN grant and evaluation are in the third and final year. However, the RCLN initiative is expected to continue, grow and adapt to the needs of the initiatives partners. It has already moved beyond the original parameters of the initial grant in many ways. The technology infrastructure is now complete, but the initiative is far from being fully implemented. The full potential of the RCLN will likely not be met until long after the initial grant has ended. While there are many issues that could be discussed, this paper focuses on what happens after the infrastructure is in place. Three issues are specifically

addressed: Cost, Content, and Learning. These issues are presented as common misconceptions people have about online learning.

Misconception 1:	Establishing a virtual learning environment is a low cost alternative to traditional education.
Misconception 2:	Quality online course production can be done easily and effectively by content experts (i.e., teachers).
Misconception 3:	Providing students with online learning opportunities empowers them as learners.

Misconception 1*: Sustainability Costs*

Learning online is commonly assumed to be a low-cost alternative to traditional education (Sherry, 1996). Once online courses are developed, the belief that somehow these courses become a low- or no-cost educational solution is typical among those unfamiliar with providing online distance education. As with most projects of this nature, RCLN startup costs were a major expenditure, but they are not the only costs. Sustainability costs include: technology maintenance, initiative administration, and course maintenance.

- Technology does not maintain itself and is often obsolete before it can be installed. The costs associated with maintaining fiber optic lines, networks, web portals, licensing agreements, hardware, and telecommunication equipment are basic sustainability costs. This does not include the cost of training and trouble shooting.
- Initiative administration costs fall into two categories: management and facilitation. Project management includes supervision of course registration, access, and promotion. Course facilitation involves hiring teachers to manage specific courses. This often includes assessment of learning, and feedback to

students. Both types of administration costs require long term funding commitments.

- Course maintenance costs can be quite expensive also. Once new courses are developed, tested, revised and implemented; resource links must be continually checked and verified, content must be updated, linked to State standards, and assessment instruments must be maintained and revised on a regular basis.

Misconception 2*: Course Development*

Because of delays in technology infrastructure implementation, the RCLN's options for the types of courses it could offer have been confined to courses that could be delivered via the Internet from external providers of course content. With the installation now complete, the range and type of courses offered can be expanded. At present, the RCLN continues to rely on packaged courses from external virtual school sources. Tuition costs for these courses are passed onto individual students or schools, depending on why and when the course is being taken. Providing this learning opportunity at a cost to students is not what was initially intended. A key factor in lowering the cost of providing courses online is to have courses developed exclusively for RCLN. However, the proper design of online instruction is a complicated task.

A common misconception many have about online learning is that quality online instruction can be developed quickly and cost effectively by almost any content expert (Adler, 2001, Merrill, 1997). Yet, without the assistance of teams of trained experts who understand what is involved both pedagogically and technically, developing online instruction can be a frustrating experience for the developer and those taking the resultant course.

Currently, the RCLN has initiated efforts to recruit teachers and begin the development of the following courses: Algebra I, Geometry, English, Art History, Geography, US History, Government, Biology, Spanish, Business Math, Health, Business Technology, and ISTEP Remediation. The quality and effectiveness of these courses have yet to be determined.

Misconception 3*: Online Learning*

The purpose of providing instruction, online or otherwise, is to promote learning (Gagne, Briggs, & Wager, 1992). And while there are many reasons why an online course might be offered as a method for delivering instruction, a common complaint regarding online courses is that few can be categorized as instructional; fewer still as high-quality instruction (Merrill, 1997; Weiss, & Pasley, 2004). This is particularly problematic for asynchronous online independent study courses (Davies, 2004). An abundance of independent study online courses seem to rely on the assumption that providing course content online empowers students to learn on their own. One should not assume that students have learned simply because the have completed the task requirement for a specific online course. Some common problems with these types of courses include: accreditation and the ability of schools to ensure authenticity of student work, template driven repetitively boring content delivery, and the challenge of properly measuring student learning at a distance given the limitations of current technology. Unfortunately, many educational institutions that support and promote learning online often do so regardless of the fact that the online courses they offer rarely provide an effective alternative to quality classroom instruction. The result is that more students now take and complete online courses, but many of these students only achieve superficial, temporary knowledge. Although technology is an integral part of distance education, any successful program must focus on the instructional needs of the students, rather than on the technology itself (Sherry,1996).

Discussion and Conclusions

The main reason for establishing the RCLN was to provide students with greater access to a more diverse curriculum, and to share resources between school corporations. In many ways the RCLN has accomplished these goals. Students now have access to a variety of online courses they may not have had otherwise. In addition, students and teachers are beginning to understand and use the learning network's capabilities. The RCLN has benefited the participating schools in terms of being able to share qualified teachers, providing instructional resources, and facilitating inter-class and school

collaborations. The current success of the RCLN initiative is due largely to a competent and dedicated board of directors, and the availability of CAPE grant funding. Future success of the initiative, among other things, will depend on the RCLN's ability to establish a sustainable capacity to cover costs and improve service.

While there have been many startup challenges, the technological infrastructure component has been the least problematic aspect of the RCLN initiative. Unfortunately, the claim that virtual learning provides a low-cost, quality learning experiences is unfounded in many respects. Sustainability remains one of the greatest challenges facing the RCLN. Costs associated with technology maintenance and upkeep, quality course development, and administration are currently being covered through their CAPE grant. This will not always be the case and the cost of running this learning network will extend beyond CAPE funding.

If the initiative is to endure, a steady source of funding must be established. The cost of providing online content from external sources would only be affordable through student registration fees. Developing RCLN's own courses will go a long way to reducing registration cost but will not eliminate them. The cost of facilitating and administrating local courses, the cost of technology upkeep and maintenance, and the cost of training teacher facilitators will remain. Developing and exporting RCLN courses through a specific outreach strategy, developing additional revenue sources, and establishing reasonable user fees are all possible answers. The appropriate solution will depend on the types of courses being offered; as well as the location and the reason for offering a particular course. A variety or combination of approaches may be needed; however, the monetary sustainability of the RCLN is not the only concern. If the initiative is to endure, quality online and distance learning capabilities must be established and maintained. Stakeholders must also grow to accept and support the initiative. And perhaps most important, student learning must become the most important objective.

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Computers and Theory in Education: The Good News and The Bad News

Margaret E. Downs

Abstract

This research paper discusses the three types of teaching theories, two of which are already known, Andragogy and Pedagogy, and introduces Infantagogy. The primary characteristics of each theory are discussed to show the importance and differences of each developmental stage. Then, from a more technical perspective, each learning group is discussed to show the appropriate use of computers in each age group.

The most important years of a person's life are not the years of the university.
Rather it is the period from birth to seven years.
For that is the time that the intelligence itself is being formed.
– Maria Montessori

Introduction

As an online professor, I often hear from my graduate students all over the world about the progress of their own students in the classroom. These teachers are in the trenches, teaching all ages and often relay that, "kids don't want to learn and the older they are the harder it is to get them interested in learning" (teacher/graduate student).

Computers are being introduced to children at very early ages!! And even as a great advocate for computers and online learning I have to say -- too early! This paper discusses why large amounts of computer exposure during the K-12 years needs to be guided and any computer exposure before First grade, is too early for a child. The result of more computer interaction at early ages rather than more human interaction is children who have lost interest

in learning – they are losing the sense of wonder. Computers are not giving and nurturing, they have to take commands. With the aid of the computer, children are losing the innate connection with their own sense of wonder and creativity that must be nurtured by their environment to foster their natural desire to learn.

Infantagogy is a term that is now being introduced via this article. Infantagogy is the art and science of growing healthy infants to be well developed children and adults. Infantagogy is a child-based type of teaching. The babyhood years of 0 to 7 are extremely important and categorized in different genres and in different age groups such as infants, toddlers and pre-schoolers. However, Infantagogy encompasses those genres and focuses building a solid healthy foundation for a person through a supportive environment in order to have optimal development during these young years. With this teaching method, teacher's provide the learning environment and then provide objective observation with the purpose of helping the child to the next level of mastery once the task at hand is mastered by the child. The time this takes for each child varies.

An infant's needs as a learner are much different than an adult's or an 8 to 21 year olds needs. From birth, we are sponges, what goes in will come right back out. The infant child soaks in every aspect of the environment through their spirit and all their senses: sight, smell, sound, taste and touch. "The immense influence that education can exert through children, has the environment for its instrument, for the child absorbs his environment, takes everything from it, and incarnates it in himself" (Montessori, p.66, 1988). Humans are constantly moving, absorbing, and growing but the younger ones are doing all of this at a much more tremendous rate. According to the most recent scientific research on brain

development, “by the time a child is 6, the child’s brain is 90% to 95% its adult size” (Wallis, p. 59, 2004).

Healy (2003), even though she is not a ‘Montessorian’, has stated that “the more I read current research about the developmental trajectory of the growing brain, the more I become aware that Maria Montessori already realized a great deal of what we know now—and she did it without the benefit of scanners, f-MRI’s, and complex technologies. How did she do it? She watched children; she watched them sensitively, intelligently, and wit an eye to appreciating how each youngster’s pattern of development was unfolding. A very impressive accomplishment, and unfortunately, not one often emulated in today’s top-down educational systems!” (Healy, p.3, 2003). Though Infantagogy, or child-based teaching which is similar to “Montessorian” style of teaching, is not new, it is now being given the name Infantagogy so that today’s educational systems may have a way to integrate it for the well-being of our children.

Pedagogy is the art and science of teaching children. This type of teaching is typically known as teacher-based, meaning the students learn according to the teacher’s agenda and curriculum (Conner, 2003).

As a teacher, it is important to know and understand the student’s needs. All learners have similar needs:

- Learners must be ready to learn
- Learners need clear objectives
- Learners needs to be taught at multiple levels of cognition
- People learn best through a variety of techniques (Mott, 2004)

Unless children have the opportunity to learn from their environment, a small window for development will be missed. One of the keys to teaching young learners is that they are

naturally interested in what is appropriate for their particular learning stage. If the information that is important in those phases is not presented, they won't know it. The learning activities then become inherently rewarding to them and boost their self-confidence (McKenzie, 2003).

The art and science of adult learning is known as Andragogy. As children mature and become adults, they enter a new learning phase with different needs. Malcolm Knowles (1970), defined Andragogy as "an emerging technology for adult learning." His four Andragogical assumptions are that adults:

- Move from dependency to self-directedness;
- Draw upon their reservoir of experience for learning;
- Are ready to learn when they assume new roles; and
- Want to solve problems and apply new knowledge immediately.

Though, the concept of Andragogy later evolved to include all levels of learners, both child and adult. Some theorists have made two distinctions between these terms. Andragogy has a learner-based focus so that the learning strategies target the particular group and situation of learners at any given time (Conner, 2004). Today's adults accept responsibility for their own learning where as, young learners depend on others to design their learning and aid this learning experience to completion. Adults seek educational experiences related to their current professional and personal needs, where as young learners attend school because they are required to, not usually because they elect to go to school. Young learners do not have as much choice in their learning as adults. Adults need to know why they need to learn something and that they need to learn experientially (Kearsley, 2004)

Adults are ready to learn because what they are learning is relevant to what they are doing. Why can't this be true for children? We make our children learn a multitude of facts and figures every day. They ask, "Why am I learning this?" and the common reply is,

"Because you have to." If educators can agree that children can be self-directed, then we could also agree that their natural desire to learn would flower in our schools if they were given more control over how and what they learn (Carlson, 1989). For example, when the environment is prepared so that it provides the appropriate developmental aids, and the child has access to those aids, then the natural unfolding of a child's potential occurs as they are ready for it to happen. A specific illustration of how developmental aids integrate learning experiences, is when a child is working on long multiplication and using a checkerboard and beads, "her eyes take on the layout which materialized the pattern of the final abstract multiplication algorithm; the hands feel and manipulate beads, which materialize the numbers and the multiplication facts; the fine motor controls in the hand move these beads through the motion, thus materializing the abstract operation. This is an immediate, integrated experience with mathematical phenomena. What a CAI (Computer Assisted Instruction) program has to offer is comparably detached activities on keys and a picture on the screen" (Gebhardt-Seele, p. 2, 1994).

We will discuss more about how instructional choices are developmentally important for the different learners in the next section. In summary, the theories we have discussed have the following characteristics:

INFANTAGOGY © Downs AGES 0-7	PEDAGOGY AGES 8-21	ANDRAGOGY AGES 22 +
<u>Child-based Teaching</u> focuses on providing the environment for the child to master their current developmental stage	<u>Teacher-based Teaching</u> focuses on the students going through the pre-determined tasks in a developed curriculum.	<u>Learner-based Teaching</u> focuses on providing useful information that is relevant to the adults life.

Technically Speaking

"After you have developed your own brain,
then you can have an artificial one to play with."
-- Mother of a 6 year old Vancouver, Canada

The good news is that computers are beneficial to these theoretically defined educational groups Pedagogy, and Andragogy, but in different ways. Adults and older children can manipulate the computer to obtain desirable information and results. For younger children, short periods of time at computers and with parents or teachers interacting and guiding children are positive activities for the child's development (Healy, 1998). "The specific developmental tasks at each age level demand different responses to the child's needs. In that view, computers seem to be helpful to children of age six and more" (Gebhardt-Seele, p. 1, 1994). Adults are more responsible and self regulating and typically know that balancing life with computers is important. In fact, scientist's recent brain research shows that,

> The very last part of the brain to be pruned and shaped to its adult dimensions is the prefrontal cortex, home of the so-called executive functions – planning, setting priorities, organizing thoughts, suppressing impulses, weighing the consequences of one's actions. In other words, the final part of the brain to grow up is the part capable of deciding. I'll finish my homework and take out the garbage, and *then* I'll IM my friends about seeing a movie (Wallis, p. 61, 2004).

Because the teenager is being bombarded with hormones and many expectations, the role of the parent is very important. "7 Rules for Parents" (Wallis, P. 65, 2004) are included in the Appendix A for additional information on how to help teens who are having to make difficult decisions and need adult guidance.

The bad news is that computers are not beneficial to the Infantagogical group of learners. Due to the "developing nature of preschoolers' eyes, wrists, hands, and backs, and the suspected sensitivity of fast-growing organisms to electromagnetic radiation, you should be

very cautious with your youngest pupils" (Healy, p. 218, 1998). What happens when a child interacts with a computer is that the focus of learning is lost and turned to having fun manipulating the neat looking things on the screen.

> During the early years, the brain has a staggering number of developmental tasks to accomplish and the environment influences its formation. If the environment is a poor one, final sculpting of neuronal connections will bypass or distort important aspects of development. During these critical periods then the brain is changing rapidly, we may see relatively sudden growth (interspersed with needed regressions, or "rest periods") in a child's ability to perform certain types of mental operations. Since virtually all parts of the brain are active during these years, anything that limits appropriate experiences or sets up undesirable emotional/motivational patterns will have a profound and lasting effects (Thatcher, in Cicchetti, pp. 565-596, 1994).

In other words, the developmental phases and learning abilities that are lost or inappropriately stimulated because the environment did not support its most beneficial development, cannot be recovered.

Conclusion

"If we allow our children to be raised and
educated by machines, we should not be surprised
if they grow up without humanity."
-- Jane Healy, Ph.D.

If our goal as educators is to assist in developing stable, well-rounded human beings who can deal with the "real" world or society as it is, then we need to look at how to assist and support all parents in our communities in providing the Infantagogy stage of learning with a rich and supportive learning environment. These actions would in turn provide more curious children, less stressed teachers and ultimately, well rounded adults to live in a more stable, peaceful world.

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Appendix A

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7 Rules for Parents by Laurence Steinberg

Drawing on the latest scientific studies of adolescents, Laurence Steinberg, a professor of psychology at Temple University, offers this advice for the parents of teens:

1. WHAT YOU DO MATTERS

Many parents mistakenly believe that by the time children have become teenagers, there's nothing more a parent can do. Wrong. Studies clearly show that good parenting continues to help teenagers develop in healthy ways, stay out of trouble and do well in school.

2. YOU CAN'T BE TOO LOVING

Don't hold back when it comes to pouring on the praise and showing physical affection. There is no evidence that adolescents are harmed by having parents who are unabashedly loving – as long as you don't embarrass them in front of their friends.

3. STAY INVOLVED

Many parents who were actively involved in their child's life during the early years withdraw when their child becomes a teenager. This is a mistake. It's just as important for you to be involved now – maybe even more so. Participate in school programs. Get to know your child's friends. Spend time together.

4. ADAPT YOUR PARENTING

Many parenting strategies that work at one age stop working at the next stage of development. As children get older, for example, their ability to reason improves dramatically, and they will challenge you if what you are asking doesn't make sense.

5. SET LIMITS

The most important thing children need from their parents is love, but a close second is structure. Even teenagers need rules and limits. Be firm but fair. Relax your rules bit by bit as your child demonstrates more maturity. If he or she can't handle the freedom, tighten the reins and try again in a few months.

6. FOSTER INDEPENCENCE

Many parents erroneously equate their teenager's drive for independence with rebelliousness, disobedience or disrespect. It's healthy for adolescents to push for autonomy. Give your children the psychological space they need to learn to be self-reliant, and resist the temptation to micromanage.

7. EXPLAIN YOUR DECISIONS

Good parents have expectations, but in order for your teenager to live up to them, your rules and decisions have to be clear and appropriate. As your child becomes more adept at reasoning, it's no long good enough to say "Because I said so."

Laurence Steinberg's most recent book is the **10 Basic Principles of Good Parenting** (Simon & Schuster)

From Theory into Practice with Action Research

Christina S. Doyle, Ed.D.
Associate Professor, CSUB
cdoyle@csub.edu

Introduction – The Calif. State University, Bakersfield campus serves a population of students who are, for the most part, working full-time and taking courses in an extended day arrangement. This is more strongly so for the graduate studies program in School of Education, where I am working as a newly hired faculty member. The service area we cover extends for an area of more than 100 miles and in the past four years the program has migrated into a distance-learning format that includes WebCT for all or a part of most courses. The courses I teach, in Curriculum and Instruction, are usually a hybrid approach with 2/3 of the course being on-line and 1/3 held through ITV. My students usually are in the studio with me in Bakersfield, in a studio classroom at the Antelope Valley campus or watching/taping the programs at home.

A word about my background – my experiences have been, for the most part, in the K-12 educational sector where I have been a teacher, a district and county Director of programs as well as working for the Cal State Univ. system as Associate Director, California Technology Project. In this capacity my focus was on learning with technology as well as the professional development of teachers rather than the "hot" end of technology, new and emerging products. Last year I retired as a credentialed teacher and administrator and began a new career chapter as faculty at CSUB, graduate studies in education. Of course, the learning curve has been steep and the rewards with students have been high.

Background - In developing courses, a priority has been to teach from theory into practice. Today I'm sharing with you an approach that has been very successful in a course entitled Instructional Strategies, EDCI 520. This is a mandated course for all students seeking a degree specializing in C & I, so enrollment runs about 30 students a term. Our textbook is *Classroom Instruction that Works; Research-based Strategies for Increasing Student Achievement,* by Robert Marzano, Debra Pickering and Jane Pollock, ASCD (2001). This has been just the right textbook for these students, as we have a chance to discuss both the research basis and nine categories of instructional strategies. A few assumptions are made in the first class that guide our work:

- we are all both learners and contributors
- we will access our "laboratories" the classrooms or groups with whom we work
- risk-taking, trying new strategies, is encouraged and will be supported

During the ten week course that we are together we will have weekly discussions that include on-line sharing of "what works for us", a partner project to be completed on-line, and two other assignments that build to an early practice with action research, a self-description of practice from a videotape of themselves implementing one of the strategies from the text.

Our first project involves practice in observing another teacher at work with students. This takes place in our second class session and involves a website of streamed video lessons compiled through a PT3 grant to Arizona State University, http://tblr.ed.asu.edu/pt3 Prior to the observation the class has previewed a template in common use in California, called the Classroom Observation Form, modeled on the Beginning Teacher Support and Assessment program goals. A brief explanation is in order.

In 1998, the California Commission on Teacher Credentialing began a program for new teacher support named the Beginning Teacher Support and Assessment Program, which educators quickly shortened to BTSA. A first step for BTSA leadership was development of California Standards for the Teaching Profession (termed CSTP by the acronym-prone.) A copy of this is included in Appendix. Since then, California's accountability system has become more comprehensive. Schools are now held accountable for continuous improvement in students' academic progress, measured through state-wide norm-referenced and criterion –referenced tests. Schools with declining test scores may be assigned a School Assistance and Intervention Team (SAIT) that will conduct an intensive study of the school and develop a plan for remediation that must be implemented by the school. Two years ago two such schools were identified locally and I was the lead on one of the SAIT teams.

The form used in this class is used in all SAIT investigations (and beyond); it is based on the CSTP's and, as quantifiable data, is one input into the development of the school plan. We use it here as a tool for observing teacher behavior during a class. A copy of this is included in Appendix.

First steps - The initial observation is done in class together. The lesson lasts about 25 minutes. Featured is a third grade classroom in Lake Charles, Louisiana. The teacher is Karyl O'Bannon and the lesson is titled Awesome Authors. In class we preview the form, watch the lesson as each person completes the form. Continuing with the think-pair-share strategy pairs of students discuss and rate each standard and we discuss our findings together. Usually, our discussion goes into a real discussion mode as we consider the highest level of critical thinking that was observed during our viewing.

This first activity provides a common baseline for observing teaching behavior in a classroom. Discussions include what evidence there was for our observations, whether our observations are based on inference or actual observation, including a question or two on what the third graders learned in this activity and our evidence for this. This is preparation for the first scored project in the course, an independent practice assignment, observing another lesson from this website using the template and then writing a description of observations.

Action Research Introduced - Soon after working on the assignment in independent observations, action research is introduced in class as a model for research design. Along with a reading selection that provides an overview of the topic, we make use of our shared knowledge about the Awesome Authors lesson to discuss how we might apply

action research to this lesson. We can then move on to including possible applications from students' independent observations. Elliott Eisner, in The Enlightened Eye, mentions the value of using videotapes for self-assessment as a first step in developing skills in observation. He was an inspiration for this project. In this past spring term we had a guest expert who joined our virtual class for a week to discuss action research and answer any questions on this topic. We had modest participation, but students and guest enjoyed the experience.

National Board Certification of Teachers - One more theme that becomes part of our knowledge base is National Board Certification for Teachers. This is introduced as we begin to discuss the final project, the videotaping and description of personal practice., when an NBC teacher joins our class for an overview of the process she went through and personal tips for success. At this time students learn about the process and it's foundation in action research, our speaker shares the deep personal value of the application process, and a guideline for writing observations is provided. Discussion about the start-up of a cohort for NBCT beginning this September encourages all to consider this as an option for a part of their Master's program. I am hopeful some will take me up on this and we can forge a process for including this. An adaptation of an NBCT scoring rubric is included in this assignment. A copy of this rubric is included in the Appendix. There is a wealth of information for each step in the process available at http://www.nbpts.org.

Even with this preparation the videotaping creates fear and anxiety for the students. There is always a flurry of emails as folks fall apart a little bit in process but finally the videos and narratives arrive. Many will arrive with a completed observation form, some will come with samples of student work but each will bring a unique perspective to this assignment that adds richness to the aggregated product!

I noticed that there were at least two students who chose to teach summarizing, using the material in the textbook. One is a Kindergarten teacher and the second is a high school AP English teacher and their application of the strategy could hardly be any more different. In Kindergarten, the teacher was having her students prepare a welcoming bulletin board for next year's K students sharing their favorite things from the Kindergarten year. Students sat on the floor bunched around the teacher's knees and in their excitement they kept inching forward even more. They loved remembering their favorite activities! In the second class there was quiet and order as students considered summarizing a quote from Emerson and working on the wording. I just wanted to share both tapes with these teachers and launch a conversation around the similarities and differences and move on from there. What fun to see how these strategies change and adapt over the grades. Perhaps in the near future we can find ways to share tapes and benefit even more from the shared wisdom in our classes.

In the reflective portion of their comments, many students showed clarity in thinking and problem-solving. Many moved to the level of student learning and were able to focus here, which showed maturity. A few shared that they'd like to do this every year or more frequently even as a personal reflective activity Several students have said that this was

the most meaningful course they have had. My own objective is that these students gain new tools with which to hone their teaching practice and to help them in further studies at this level. Students regularly comment that this is one of the most practical courses they have taken and, after the fact, they think the videotaping self-assessment was most powerful.

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Emerging Theories of Learning and Preservice Teachers

Demetria L. Ennis-Cole, Ph.D., Associate Professor
Technology & Cognition, College of Education
University of North Texas, P.O. Box 311337
Denton, Texas 76203-1337
Telephone: 940-565-2057 (X3536)
E-mail: ennis@unt.edu FAX: 940-565-2185

Abstract

Preservice teachers need knowledge of learning theories, knowledge of the impact of these theories on the development of software, educational tools, and classroom practices. Existing and emerging learning theories, the relationship between technology and learning theories, and ways to help preservice teachers develop an educational philosophy are discussed.

Keywords: learning theories, educational philosophy, preservice teacher needs, technology

In many cases, preservice teachers have very little knowledge of educational philosophies. Many have not studied Behaviorism or Constructivism in depth, and few have been exposed to emerging learning theories: Cognitive, Social, and Radical Constructivism, Multiple Intelligences, and Situated Cognition.

As these new professionals enter their classrooms, they do so without a personal philosophy of education. Often, they have little knowledge of technology's impact on teaching and learning, and they have limited knowledge of the ways learning theories impact software development, classroom management, or technology integration. This lack of knowledge renders them unable to apply learning theories or technology in ways that promote learning, retention, and transfer. According to Wang (2002), preservice teachers are exposed to computers, but they are often unaware of the impact of teaching approaches on computer use. They instruct from a traditionally teacher-centered paradigm that does little to foster creativity, transfer, or cooperative learning.

This paper discusses established and emerging learning theories, the relationship between these theories and technology, and ways to help preservice teachers develop personal educational philosophies that guide their selection, implementation, and utilization of classroom technology.

Established and Emerging Learning Theories

Two of the most well established learning theories are Behaviorism and Constructivism. The emerging theories consist of variations of Constructivism, the theory of Multiple Intelligences, and Situated Cognition. The most established learning theory before Operant Conditioning was Classical Conditioning. A Russian Physiologist named Ivan Pavlov proposed Classical Conditioning; he believed behavior consisted of involuntary physical responses to external stimuli (Roblyer, 2003). The most commonly used illustration of this theory is that of a dog salivating each time a bell rang. The dog was conditioned to associate a ringing bell with

mealtime. The ringing bell was external stimuli and the dog's behavior, salivation, was the involuntary response to that stimuli.

Behaviorism

Pavlov's Theory heavily influenced thoughts about learning until B.F. Skinner proposed Operant Conditioning (foundation for Behaviorism). Skinner felt that human learners could exercise mental control over their behavior, and their responses to stimuli could be shaped by the type of reinforcement they received. Teachers, in Skinner's view, were to arrange the contingencies of reinforcement in ways that promoted and supported student learning (Roblyer, 2003). Skinner identified several situations that could shape learner behavior: punishment, positive, and negative reinforcement.

Punishment decreases the likelihood of undesirable behavior, because it results in an undesirable consequence. An example might involve giving a student a failing score when s/he commits plagiarism. Positive reinforcement affirms the learner and increases the likelihood of a desired behavior; often praise, rewards, and encouragement are used in order to get learners to perform the desired behavior (i.e., study harder, pay attention, respond in class, etc…). Negative reinforcement also increases desired learner behavior, but this occurs when a stimulus is avoided or removed. Usually, something a student dislikes (losing a privilege, going to detention, going to the principal's office) is removed or avoided when the student performs the desired behavior.

During Skinner's time, it was not possible to directly observe brain activity and study internal processes inherent in learning, so he focused on observable cause-and-effect relationships that shaped human behavior. Behaviorism, also known as stimulus and response conditioning, relies on teacher directed approaches, student receptiveness, curriculum sequencing from prerequisite to advanced skills, mastery, systematic instructional design, and objective testing to assess competence. Contributors to the area of Behaviorism include Edward Thorndike, Richard Atkinson, Robert Gagne', David Ausubel, Leslie Briggs, David Merrill, and others.

Constructivism

Another established learning theory, Constructivism, is rooted in philosophy and psychology. In Constructivism, learners are active participants in teaching and learning contexts; they create knowledge based on their experiences and instructional relevance. According to Doolittle and Camp (1999), four tenets of Constructivism exist:

"1. Knowledge is not passively accumulated, but rather, is the result of active cognizing by the individual;

2. Cognition is an adaptive process that functions to make an individual's behavior more viable given a particular environment;

3. Cognition organizes and makes sense of one's experience, and is not a process to render an accurate representation of reality; and

4. Knowing has roots both in biological/neurological construction, and in social, cultural, and language-based interactions (Dewey, 19161980; Garrison, 1997; Larochelle, Bednarz, & Garrison, 1998; Gergen, 1995; Maturana & Varela, 1992)."

Constructivists view learning as the development of insights. Knowledge is constructed in the mind of an active learner who is interactive rather than reactive (Rieber, 1991).

Constructivists Teachers see themselves as facilitators. Students work collaboratively to explore, discover, and gain competence. The learning environment encourages the development of higher-and-lower level competencies through hands-on projects that are assessed authentically. Contributors to Constructivism include John Dewey, Jerome Bruner, Lev Vygotsky, Jean Piaget, Howard Gardner, and others.

Some of the emerging learning theories are Cognitive, Social, and Radical Constructivism, The Theory of Multiple Intelligences, and Situated Cognition. These theories focus on individual and shared meaning, the strengths associated with learner diversity, and knowledge acquisition through ordinary problems.

Cognitive, Social, and Radical Constructivism

Cognitive Constructivism is based on information processing and the ability to reconstruct external reality (Doolitle & Camp, 1999). Learning is viewed as an accurate internalization of external representations found in the "real world." Knowledge construction is highly technical and relies on the learner's ability to create appropriate and accurate mental structures. Aspects of Cognitive Constructivism have contributed beneficially to understanding learning and instruction and creating useful instructional aids: concept maps, problem solving strategies, advanced organizers, and reading strategies. An example would be that of a student learning a problem solving strategy and using it to accurately solve a given problem.

Social Constructivism, according to Hung (2001), defines learning as a social or collaborative process framed in terms of cultural perceptions. The acquisition of knowledge is not an exclusively individual process, but an interactive exchange which results in shared meaning. Scaffolds are used to allow learners to bridge the gap between current and future knowledge. Based of Vygotsky's theories, Social Constructivism emphasizes the significance of peer-to-peer interaction in the construction of knowledge. Classroom interactions enter around shared and negotiated meaning. Students gain a personal understanding of concepts, procedures, and processes. They are evaluated on their ability to collaborate and generate workable (rather than correct) problem solutions.

In Radical Constructivism, knowledge is internal to the learner. Its acquisition is adaptive and experiential. Knowledge varies from learner to learner, and it is not based on a "universal truth" or accurate replication of external phenomenon. Evaluations are based on internally coherent understandings that are well defined and viable to the learner. Correct representations that match a textbook or teacher's solution are not encouraged.

The Theory of Multiple Intelligences

Howard Gardner's Theory of multiple intelligences is an extension of Constructivist thought. Gardner attempts to define the role of intelligence in learning; his work is based on that of Guilford and Sternberg (Roblyer, 2003). Eight different types of intelligence are postulated: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, intrapersonal, interpersonal, and naturalist. Student learning relies on activities and authentic assessments that capitalize on these innate abilities.

Situated Cognition

Hansen (2002) indicates that Situated Cognition is a theory of learning that relies on realistic problem solving scenarios. Students participate in contextually relevant learning environments where they discover and apply new information, solve problems, gain access to expert perspectives, participate, and practice. Elements of Situated Cognition include authentic content, activities, and assessment; observations of multiple roles and perspectives; collaborative knowledge construction; reflection, articulation, and scaffolding.

Technology and Learning Theories

Behaviorism emphasizes memorization and repetition in teacher-centered environments. The curriculum is structured hierarchically to allow students to gain prerequisite skills and advance to intermediate and advanced levels of knowledge. Predefined criteria and systematically constructed learning promote mastery. Technology is used to remedy identified weaknesses, promote fluency, and support practice through tutorials, drill and practice software, online worksheets, and other forms of computer-based learning (Hung, 2001; Roblyer, 2003).

Constructivism allows students to build rather than receive knowledge. Based on collaboration and cooperation, Constructivist Learning focuses on real problems, creative solutions, transfer, and problem solving. Teachers function as guides or facilitators that assist students as they generate solutions and explore in complex and rich environments. The curriculum focuses on higher-and-lower level skills; performance measures include checklists, rubrics, and portfolios. Technology (simulations, applications software, multimedia, constructive and informative software tools) is used to facilitate metacognitive skills, emphasize transfer, create group projects and presentations, highlight the contributions and talents of diverse learners, and explore the relationships between data.

Cognitive, Social, and Radical Constructivism, Multiple Intelligences, and Situated Cognition rely on individual and group thoughts, perceptions, and actions. Problems are solved through individual and shared meaning. Learners use technology (hypertext and hypermedia, bulletin boards, chats, computer-supported intentional learning environments, and computer mediated environments) to gather information, conduct research, communicate, decompose problems, share documents, and participate in open-ended learning.

Helping Preservice Teachers Build a Personal Educational Philosophy

Learning theories are extremely important; they frame the learner's classroom experience, guide the teacher in establishing classroom interactions, technology applications, and classroom activities. They affect learning outcomes, classroom management practices, and the role of the teacher. As such, preservice teachers should be given the opportunity to experiment with technology following the tenets of these theories. They should be encouraged to develop a personal philosophy of teaching, learning, and the impact of technology based on their preferred learning theory or a combination of theories, student needs, and curriculum proficiencies needed at local, state, and national levels.

One way to help preservice teachers build their own educational philosophy includes altering the preservice teacher curriculum to include a mandatory course in educational foundations and technology integration. Topics to be covered could include learning theories,

using technology (applications software (spreadsheets, databases, word processing, desktop publishing), support tools (research and reference materials, data collection and analysis software), materials generators (worksheets, puzzles, forms, certificates), and conceptualization tools (concept maps, lesson planning software)), limitations of technology, structuring optimal learning environments, local and national proficiency standards, and other topics. Other ways to assist preservice teachers include the following:

1.) have students write an educational philosophy with prescribed components and make the connection between their philosophy and classroom practice through reflective journal experiences (Roberson, 2004),
2.) require students to interview master teachers and observe their classroom practices,
3.) create opportunities for students to view, study, and discuss videos of classrooms where established and emerging learning theories are demonstrated,
4.) have students electronically communicate with established scholars who serve as mentors, and
5.) allow students to electronically search the WWW for existing educational philosophies that they critique, discuss, use for creative role playing.

Summary

Preservice teachers need knowledge of learning theories and ways to translate established and emerging theories into classroom practice. They need to have the opportunity to build individual educational philosophies that guide their selection, implementation, and utilization of classroom technology. This paper summarized several existing and emerging learning theories, the relationship between technology and learning theories, and ways to help preservice teachers develop an educational philosophy.

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Using Microworlds in Teaching and Learning

Demetria L. Ennis-Cole, Ph.D., Associate Professor
Technology & Cognition, College of Education
University of North Texas, P.O. Box 311335
Denton, Texas 76203-1335
Telephone: 940-565-2057 (X3536)
E-mail: ennis@unt.edu FAX: 940-565-2185

Abstract

Microworlds are cognitive learning tools that can be used to promote problem solving, critical thinking, discovery, and mental model development. These small, interactive, and programmable models of real world environments can create engaging and appealing environments for student learning based on Constructivist Principles: active participation, individual knowledge construction, resolution of disequilibrium, discovery, and meaningful learning contexts. The epistemology of the Microworld is discussed, examples are examined, and ways to promote active student learning are explored.

Microworlds are small, interactive, dynamic, real world environments that contain programmable objects that can be manipulated and studied (Hogle, 1995; Hoyles, Noss & Adamson, 2002; Sarama & Clements, 2002). The manipulation of objects within a narrowly specified knowledge domain first appeared in the field of Artificial Intelligence (AI) in the early 1970s. AI Researchers at MIT created small, restrictive knowledge domains as vehicles for understanding and using language, creating expert systems, and mimicking human information processing and reasoning. The first successful attempt at language interpretation using a microworld was Terry Winograd's 1972 program called Shrdlu (Drake, 2000). Shrdlu is a microworld of blocks that accepts and responds to user commands typed in English; a good description appears at http://www-pcd.stanford.edu/~wonograd/shrdlu/ .

A mathematician named Seymour Papert joined the Artificial Intelligence Laboratory at MIT and worked with colleagues to develop a programming language called Logo to help young children build and manipulate their own intellectual structures (Roblyer, 2003). Logo was combined with a robot shaped like a turtle; later the mechanical turtle was changed to an on screen turtle. Papert believed this combination would allow young children to learn math concepts in a "mathland" through experimentation, exploration, self-discovery, and self regulated instruction. His theories are described in the 1980 publication Mindstorms: Children, Computers, and Powerful Ideas. The graphical nature of Logo, its depiction of cause-and effect relationships, and its logical quality made it ideal for creating microworlds or as Paper termed them, "incubators of knowledge." (Roblyer, 2003).

This paper discusses Constructivism as the epistemology behind Logo, supplies examples of microworlds, and suggests ways teachers can use microworlds in learning contexts to promote active participation, individual knowledge construction, and the resolution of disequilibrium (a conflict between an environmental phenomenon and the learner's understanding of that phenomenon.)

Constructivism: the Epistemology for Logo

Papert's view of learning is termed Constructionism; many of its precepts come from Constructivism. Both theories concentrate on students' abilities to actively build knowledge rather than passively retrieve and store transmitted conceptual data and facts. Constructivism as a learning theory is based on the work of many scholars. Some contributors include John Dewey, Jerome Bruner, Lev Vygostsky, Howard Gardner, and Jean Piaget.

Jean Piaget

Jean Piaget was a world renowned Swiss psychologist who proposed theories about the mind and its inner workings. He studied children and their development in an effort to unlock the mysteries of the mind. His studies led him to formulate a highly influential model of child development and learning. Piaget theorized that developing children build cognitive schema or schemata - internal structures that represent organized knowledge and learner understanding. These organizational frameworks help children understand and respond to experiences in their physical environment. Piaget further reasoned that learners use assimilation and accommodation mechanisms to resolve conflicts in knowledge and understanding. Assimilation allows the learner to append new knowledge into current schema, while accommodation allows the learner to build new schema. Piaget also identified four distinct stages of child development: Sensory-Motor, Representational, Concrete Operations, and Formal Operations.

The Sensory-Motor stage lasts form ages 0-2 years, and it allows the child to build concepts about the world and how it works. These concepts are built through the child's physical and sensory interactions within the environment.

The Representational state begins at age 2 and lasts until about age 6. In this stage, the child reflects and begins to internalize actions and convert them to iconic images.

The third stage of child development, Concrete Operations covers ages 7 through 11. During this stage, the child develops abstract and symbolic abilities and creates logical structures that explain physical experiences.

The Formal Operations stage begins at about age 12 and lasts through age 15. During this stage, the child's cognitive abilities (including reasoning) resemble those of adults. The child/learner is active and heavily uses reflection and abstraction. Piaget's model of child development impacts educational pedagogy in several ways. It suggests that effectively designed curricula is developmentally appropriate, targets student growth, and emphasizes the role of active experience, discovery, and experimentation.

Constructivism relies on experimentation and experience; it is viewed on a continuum divided into several categories: Cognitive, Social, and Radical (Doolittle & Camp, 1999). Each category supports individual knowledge construction through assimilation, accommodation,

adaptation, cognitive ability, and interaction within real world environments. Social negotiation, mediation, relevance, prior knowledge, and self-regulation are also deemed important. Teachers adhering to Constructivists Principles operate in a student-centered environment where they guide learners, encourage diverse ideas and perspectives, and assist learners in the manipulation of objects, ideas, and concepts within the environment. Lessons emphasize problem solving activities, hands-on approaches, and creativity.

Constructivism, Piaget, and Papert

The link between Constructivism, Piaget, and Papert was forged in the late 1950s. During this time, Piaget was studying children and how they begin to understand mathematical concepts. He read Papert's doctoral dissertation which focused on understanding topology as pure mathematics and found it impressive. He was so impressed that he invited Papert to study with him in Geneva, Switzerland. Papert accepted the invitation and became intensely interested in studying children and the things they could accomplish. Papert later joined the staff at MIT and became a founding member of the AI Lab. He worked with colleagues to develop a programming language (Logo) that allowed children to learn difficult and powerful concepts (i.e., problem decomposition, procedures, list processing, recursion, data structures, geometry, graphics, X-Y Cartesian Coordinate System, multimedia effects, and spatial relationships) through active exploration, experimentation, and manipulation of mathematical structures.

Examples of Microworlds

More commonly used in mathematics and science, microworlds are small, complete subsets of an environment (Rieber, 1991). Non-computerized examples include Cuisenaire rods, mechanical gears, and others. The power, speed, and ability to create realistic graphics quickly make the computer an ideal platform for designers and users of microworlds. Several computer generated examples of microworlds include some simulations, Logo Turtle Geometry, Space Shuttle Commander, Mathsticks, and others.

Some Simulations

Simulations are a form of Computer-Based Instruction that allows users to alter variables and observe cause-and-effect relationships. Simulations that replicate real life scenarios (flight simulators) without permitting users to experience different outcomes or understand underlying conceptual models are not considered microworlds (Rieber, 1991). In order to be a microworld, a simulation must permit debugging, help learners understand the conceptual model for knowledge, house useful ideas that can be connected to other learning, encourage experimental learning, contain simple domain knowledge recognized by an expert within the domain, and represent a complete subset of a domain (Hogle, 1995).

Logo Turtle Geometry

Logo Turtle Geometry allows users to experiment with geometric concepts by manipulating a turtle that follows user commands. The turtle can be used to learn the X-Y Coordinate System or draw elaborate graphics using circles, rectangles, and squares. Users can create procedures and decompose spatial and logical problems into smaller, more manageable entities. Students manipulate the turtle by giving it directions, changing its shape and position,

and thinking about the objects they create and change. Interaction with the turtle produces feedback which encourages reflection and assists learners as they resolve the natural conflicts that arise as they interact in the Logo Environment.

Space Shuttle Commander

Space Shuttle Commander was designed for elementary and middle school students; it gives students instruction on Newton's Laws of Motion (Hogle, 1995) by combining tutorials in flight lessons with simulated space shuttle missions based on Newton's Laws. It combines an instructional hierarchy of tasks with exploration and self-discovery. It requires some teacher guidance and support to channel the incidental learning that occurs as a result of exploration and student discovery.

Mathsticks

Mathsticks is a microworld designed to help students appreciate number patterns as functional relationships (Hoyles, Noss & Adamson, 2002). It allows students to use special – purpose tools (i.e., dot, jumpl, match, hmatch, rmatch, etc…) to assemble sequences of objects on the screen and directly manipulate them. User actions are linked with graphical representations and feedback immediately supplied. Students create objects that match those given. In the process, they learn structural details, relationships between objects, and instances of classes. The creators of Mathsticks found that student learning was related to the interaction between learner actions and the mathematical relationships encapsulated within the microworld (Hoyles, Noss & Adamson, 2002).

Some additional examples of microworlds include Green Globs and TGEO. Both are used to allow students to gain knowledge of mathematical models, enhance problem solving ability, and support student debugging and mental model formation. To view web-based examples of microworlds, review the following urls: http://www.coe.missouri.edu/~jonassen/courses/mindtool/MicroworldExamples.html, http://www.phrontis.com/mfs.htm, and http://www.lbl.gov/MicroWorlds/.

Promoting Active Student Learning with the Logo Microworld

Students can actively participate in developing their own knowledge structures with Logo. They can use the turtle to study geometric principles, the X-Y Cartesian Coordinate System, and algebraic equations. A student who knows a few Logo Primitives (commands) can make an on screen turtle change its position, move to precise coordinates, and create elaborate shapes and designs. By actively interacting with the turtle, students learn spatial and numerical relationships that can be transferred to other problems.

Students can experiment with powerful programming concepts (i.e., problem decomposition, list processing, recursion, data structures) in the Logo Microworld. It is possible for students to learn to decompose problems into manageable segments through planning. They can use their plans to construct programs (made of procedures) that can solve problems, help them examine relationships, and strengthen their debugging skills. Planning and decomposition

are important problem solving activities that can be transferred to any domain, not just programming.

List processing, recursion, and data structures are complex programming concepts that can be explored in Logo. Concatenating, locating the beginning and end of lists, studying mechanisms for copying and referencing procedures in memory, and manipulating and storing data in trees, lists, and arrays are important skills for programmers. Correctly mastering and implementing these foundational programming concepts allows those creating programs to efficiently use computing resources and write better programs.

Logo permits students to actively create presentations that disseminate their findings, and communicate their ideas. Objects in student presentations can be animated, graphically displayed, and combined with text and sound. Transitions can be applied to give the presentation aesthetic appeal and make it cohesive.

Summary

Microworlds are small, interactive, and programmable models of real world environments that can create engaging and appealing environments for student learning based on Constructivist Principles: active participation, individual knowledge construction, resolution of disequilibrium, discovery, and meaningful learning contexts. Instructors should investigate the possibility of using a microworld to facilitate active discovery, creative expression, and problem solving.

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Presentation Software and Active Learning: Not A Contradiction in Meaning

Rob Erwin and Mary Farone
Niagara University
rerwin@niagara.edu, mfarone@niagara.edu

Abstract:

Many teachers know the value of active learning for their students, in which students are cued and guided by the teacher in their learning experiences and interactions with other learners so as to be actively engaged in their own learning. Educational technology is well suited to support and enhance active learning by students, including the very popular use of presentation software such as Microsoft *PowerPoint* or Corel *Presentation*. However, one largely unfulfilled promise of such presentation software is its potential to support and enhance these active learning classrooms, going beyond a passive learning, digital "chalk and talk" slide show function.

Most classroom teachers are being encouraged by school stakeholders to make the learning experiences in their classrooms of the "active learning" type of experiences. Various related names for these practices for classroom instruction include active learning, direct-experience (first-hand) learning, hands-on learning, constructivist learning activities, etc. There is much philosophical and empirical support for these practices (see Piaget, Vygotsky, Dewey, Papert, Cambourne, Tapascott, to name some of the well known advocates), but the general principle is that learners are to be actively involved in the construction of their own meanings, and that they acquire knowledge and skills in a more organized and more lasting manner when these are learned in an active rather than in a passive learning manner.

At the same time, teachers are being encouraged to utilize technology in their classrooms. Much of this technology does fit well with principles of active learning by students. Students may be captivated by the multi-media quality of teaching presentations, but beyond that, students are frequently actively engaged in their own on-line searches and analysis, writing activities, e-mailing activities with collaborators, data collection and analysis, hands-on guided learning and practice, developing their own reports and presentations, etc. In these activities, technology and active learning are synergistic partners for students, and technology is a fully respected member of these constructivist learning environments.

However, the teacher's utilization of presentation software is often functioning merely as a way of digitizing and enhancing the chalkboard or overhead projector, and is incorporated into teaching in a manner that allows students to be passive learners even though the *PowerPoint* slides (or Corel *Presentations*, *Hyperstudio*) themselves may be quite complex and animated. So we have colorful slides, slick transitions, snazzy added effects, but after the newness wears away in a generation or two, the learners will be as disengaged as ever.

May presentation software support and enhance active learning? Of course it can. Like most of what happens in a classroom, though, the teacher is the ultimate factor in the effectiveness of instruction, and it is up to the teacher to make the *PowerPoint* presentation contribute to active learning rather than detract from active learning. Technological wizardry by itself does not make learning happen, but it may be employed to support and enhance learning experiences, and presentation software may actually contribute to active learning experiences.

How may teachers design and use presentation software to cultivate active learning? Teachers still need to present information through the efficiency of presentation software. However, teachers may add features to their slide shows that will cultivate active learning.

We propose that this may be accomplished in at least three ways:

- to cue and guide student small- or whole-group interactions from the procedures explained on the slides
- to present data or problems for student analysis and solution by means of slides
- to capture and record the products of student small- or whole-group interactions on slides

To elaborate on the first category above, teachers may include in their presentations added screens that cue and guide student interactions. For example, group membership may be efficiently presented on a screen so students know with whom they are working, directions for the discussion task may be presented on a screen for clarity and multiple look-backs, selected content may be presented on the screen as stimulus for student discussion and for multiple look-backs. These small changes in how a slide show is designed may add important active learning components to the classroom. Instead of merely presenting content, the slides may also guide procedure.

Regarding the second category above, teachers may present various stimuli data or problems for student analysis and solution by individual or group effort. The slides involved with this would be used to present the problem set and to cue student analysis and reporting. In addition to presenting such data on a slide, a teacher may find such data presented in a web site. A teacher may temporarily leave a PowerPoint presentation and go to a live web site for viewing a problem set, then return to the presentation software for slides that guide students in the thoughtful analysis of the data viewed on the web site. In this manner, the slide is not only presenting information, but also being used to present authentic problems for student analysis, brainstorming, creative problem solving, etc. This supports higher-order thinking and active learning simultaneously.

Elaborating on the third category above, teachers may use presentation software to capture and record the products of student work in small groups or as a whole class. For example, when students are contributing to a class discussion of ideas, a teacher may create a blank screen within the slide show, and type the student ideas onto the screen in real time (or, if the teacher is uncomfortable being the scribe, there may be a student who could do this instead). This capturing of class discussion and student ideas has several advantages over handwritten notes on a whiteboard/chalkboard, in that the notes are usually more legible, are preserved for later viewing without loss to eventual board erasure, and are easily preserved for later publishing and dissemination, if desired. When student ideas are recorded and preserved in this manner, it validates and legitimizes student contributions to the class.

There are additional kinds of uses of presentation software to support and enhance active learning than the three described above, but these three would add significantly to the active learning opportunities in most instructional slide show presentations. We believe that

presentation software may be used to support and enhance the kinds of active learning classrooms that we all advocate, going beyond a passive learning, digital “chalk and talk” slide show function. Given the relative ease of adding these features to instructional slide shows, all teachers using presentation software in their classrooms should be using at least some of these strategies to engage and invite active learning by our students.

Assessment of New Media Compositions

Thomas G. Ferstle
University of Texas at Dallas
Teaching Assistant-Department of Rhetoric

Many new texts are being published to supply instructors and freshman composition classes with examples of the new kinds of computer media compositions. The theme of most of these texts takes advantage of the growing conviction that our society is a predominately visual culture, and the use of images in most, if not all, communication productions whether traditional print or new media, has led to a growing emphasis on critical skills in the production and consumption of the multi-modal products. For this discussion, multi-modal means multiple kinds of signifying systems; verbal/text, image, moving and static, photographic, computer generated graphics, and sounds. However, the typical freshman composition program lacks standards of assessment that relate the conventional criteria of textual analysis to the analysis of images. There are standards of design for webpage and graphic design provided by the communications departments and marketing theory, and there are standards of design/arrangement/delivery/style for texts, but there is no current theory that satisfactorily bridges the hermeneutic divide between these communicative elements.

Many of the new texts focus on the production of new media compositions from the aspects of cultural history or technology (see Bordwell 1989; Brennen and Hardt 1999; Croteau and Hoynes 2000; Bolter 2001; Manovich 2002). Other texts offer innovative descriptions and examples to raise the level of critical awareness of the rhetorical strategies that students may employ in reading and creating documents containing multiple modes of communications(see Berger 1990; McQuade and McQuade 2000; Faigley 2004). Unfortunately, none of these texts, outside some preliminary research, offers a classroom instructor the kind of criteria that might be used to construct a rubric to address the whole composition(Leuewen 2003). Currently, the only way to assess the multi-modal composition is to assess one element at a time and make a decision to arbitrarily weigh the influence of one or the other towards the total composition in the conventional terms of genre, discipline, and decision type.

The purpose of this paper is to describe as completely as possible the problem of the new media compositions from the perspective of an instructor aiming to assign a grade ultimately to the piece/site/document. In order to make the problem definitive, I will begin with an example of a typical

assignment that is provided students of freshman composition at a state university in Texas. The assignment is to create a document that includes an image and a text that complements or augments the visual argument of the image. Prior to the assignment, some simple aspects of visual rhetoric have been discussed by taking examples from advertisements, editorial cartoons, and film shots. The assignment is to be constructed on a MOO website. A MOO is a special type of website that supports the interactive play and education of participants within a defined webspace community. (see Haynes and Holmevik 2001)

On the MOO screen, the computer screen splits in half to allow speech/chat space on the left side of the screen, and a site/room on the other half of the screen. The left hand space is exclusively devoted to verbal text, including emoticons. The right hand room space is typically composed of an image at the top of the screen and a description field below that contains verbal/text. I have included a screen shot below.

Essay Image

In spite of all the advances of modern science over the last thirty years in fields of genetic engineering, molecular engineering, astronomy, and mathematics, the mystery of life is unsolved. It is the unsolved why. The how of DNA combination becomes more and more clear, but the intimate motivations for chemicals, substances, and materials to form what we call life is elusive. Some would say it is a sacred mystery. That is the argument that this essay offers in defense of life against the legal availability of abortion in America.

It is the sacred mystery announcing itself in the face of the unknown, for instance, in the

reaction of the Virgin to the Announcement by the angel Gabriel in the fresco by Fra Angelico above. The angel, itself a mystery to humans, announces the introduction of a Divine Providence, the Word Made Flesh, to mankind-to Mary, who is to be the Mother of a God. The theological underpinnings of this seminal event in Christian history is that this event portrays the divinity in action in the world. As the angel announces, the event occurs within Mary as she submits to the Angels declaration.

The Renaissance theologians broke this event down into five distinct stages that were typically portrayed in the art of the time. From the Disquiet, Reflection, Inquiry, Submission, to Merit, the stages of the mystery of the Annunciation is staged in art depicting the Virgin and the Angel. These stages are not so unlike the stages any woman of any time might have to the news that she is with child.

However, in our society, the law does not recognize the sacred origin of life, so it makes it profane in allowing life to be extinguished by anyones choice. Whether it is the choice of the unfortunate girl, a complicit parent, a boyfriend or husband, or doctor, the result is the denial of lifes gift to the world. It is denial of the mystery out of which all life exists. It is the attitude of a society which has become dependent on science to solve all problems, in order for society to escape the anxiety, the uncertainty that mystery brings with it.

It might be argued that this viewpoint only applies to a Christian thinker, but that is to miss the gist of the argument. Everytime a woman, in whatever context, is put into a situation where she must decide whether to continue a pregnancy once it has been learned by her, once she has heard the announcement of her conception, she is in the place of the Virgin, having to consider this question, this elementary mystery of life. How is she to decide? She is placed into a kind of reciprocal relation with the Godhead. She is to decide a question of life or death. She must face the ultimate mystery, by which no science on earth yet can guide her. She is in a region of utmost mystery.

Only a culture in denial of the reality of our inability to know could encourage her to make a decision based on such small considerations in relation to this huge mystery. Our culture offers her small comfort and consolation for her pains, mutual denial, permission to kill, permission to act as a God for a moment, or for a non-believer, to act as the knower of mysteries beyond all knowledge. For surely, to abort a child whose future seems already to be ordained by some natural order, is to abort that order, to abort a possibility in the world, some future which will never be realized or attempted, to stop life instead of encouraging or nurturing it.

Whether one is a Christian or not, it is time for our society to recognize that our pride and arrogance blinds us to the fact that we do not know the origins of life. Until we do, we place ourselves and our species in a precarious position by manipulating with the order of the world by which we find ourselves through the practice of abortion. Drug companies have alerted us to a similar situation in nature from the loss of potential remedies in the species of plants and organisms that are being destroyed and lost to extinction by our over development of the natural resources of the planet. It is not just humility that allows

us to change our minds about this terrible practice, it can also be sound, scientific principles that guide us to eliminate a profoundly disturbing and profane practice like abortion.

Links:

Finbar's Penthouse

Essay #2

Let's look closely at the image and text on the MOO to see what problems and ambiguities exist. First, the image that is displayed is a digital image of a Fra Angelico fresco displayed in the convent of San Marco in Florence, Italy. The original fresco was painted in the fifteenth century, and the image is archived at Australian National University and linked by the MOO to the student page. The subject of the image is the Annunciation to the Virgin Mary by the Angel Gabriel.

Below the image is a verbal/text that argues for the elimination of abortion in America because the act of abortion is a profanity against the sacred nature of conception. The text refers to the image by suggesting that the image is a representation of the nature of the sacred mystery of life, and compares the choice of a modern woman to that of the Virgin. There are numerous problems with the text. Passive voice constructions, mechanical errors in grammar, lack of citation for evidence, but the argument's central thesis is clearly stated and defended, though not as comprehensively as possible. These problems must be placed in context with the problems of the image.

The image is subject to the restraints of the physical dimensions of the visual space allowed for images on the MOO site resulting in some distortion of the detail. The digital source of the image does allow a fairly clear picture to be displayed. Although the text cites the image as one fresco created by Fra Angelico, there is no effort by the author to locate the image in history or its current media. The image seems to be used by the author as a kind of jumping off point for the argument.

Current guides to assessment would treat each element of the composition separately. Attention to the image would usually be addressed through the conventions of the graphic arts and web page design considerations. Criteria such as visual contrast, clarity of arrangement, consistency of visual patterns, moderation (simplicity), and balance are among the basic design concerns that most texts promote to create best practice compositions consisting of images, graphics, and text(Markel 2000). All of these criteria are subject to rhetorical concerns, especially audience.

Let us be critical of the image then. The two figures, the Virgin and the Angel are located within an outside room that displays the obvious concerns of geometric perspective relating to the High Renaissance. It is difficult to tell if the perspective is partly due to the manipulation of the image into the limited space on the page, or if the perspective is entirely representative of the original. The figures display a limited amount of foreshortening in their gestures. Their bodies are turned slightly away and the arms of both figures are intertwined in similar manner. It is easy to identify the Angel because of the wings sprouting from his back. Both figures have haloes around their heads. The building or room that the figures occupy is bordered on one side by a walled-in garden over which trees can be seen in the background. There is an elegant simplicity to the arrangement which foregrounds and emphasizes the attention of the viewer on the two figures.

The contrasts of color in the image are interesting. The angel's robe is a rose color, and his wings are multi-colored, and his hair is golden blond. The Virgin's robe is dark blue, an ultra-marine usually dedicated to images of the Virgin in contracts for paintings of the time(Baxandall 1988). Her tunic is a pale white which almost matches the walls of the room, so that her upper torso seems to disappear into the background. The faces of both the angel and the Virgin are androgynous in their beauty. The floor upon which they are located is a golden color. The room is dramatically contrasted with the darkness of the adjacent garden, wall, and forested background, though it is possible to see many white flowers that dot the ground of the garden.

I have made several assumptions in my description of the image. First, that everyone knows what an angel is, and secondly, that the Virgin is the Mother of God according to the Christian myth. The selection of this specific image by the author assumes these basic foundations or understandings to the audience of this particular argument. Third, I have assumed that viewers might recognize that the proportions of the building or room are extraordinary not only because of technical problems of reproduction on the webpage, but also because there is an emphasis on perspective in the High Renaissance among Italian painters.

Finally, without a caption to the image, I must rely on the author of the text to inform me as to the meaning of the image.

Using the criteria noted above as to the construction or design of the image, it might be stated that the image contains good visual contrast and simplicity, perhaps even elegance of arrangement. The repetition of the columns in the outside room parallel the vertical constructions of the angelic and human figures. Another repetitive motif is the arches of the room and the roundness of the haloes and the roundness of the shoulders and the bodily gestures of the angelic and human forms. The linear perspectives of the individual elements of the image, the floor of the room, surrounding walls, and angular portion of the garden and exterior wall, balance the entire image. If the viewer did not already know the reputation of Fra Angelico, from a closer analysis it is quite possible that many instructors would judge the image masterful.

Before we assign a grade to the image, let us turn our attention to the text. The first paragraph makes clear the thesis of the argument. The argument against the legality of abortion is supported by the idea that life is sacred. The author indicates that there is a sacred "mystery" to life, which makes it impossible for science to claim jurisdiction over conception. There is no reference to an image in the first paragraph or contained in the thesis statement.

The second paragraph begins with a passive sentence construction, which is not entirely clear but immediately associates the text to the image above it. The author tangles the notion of "mystery" to the idea of an angel, and also to the claim of the image, which the author tells us is the Annunciation of the conception of the Virgin. To support this assertion, the author suggests that Christian theology explains the nature of the mystery.

There is not a smooth transition from the second paragraph to the third, but the idea of the third paragraph contains an explanation of the image in theological and historical terms that are compared with modern concerns. In the transitioning to a concern about modernity, the author begins the fourth paragraph arguing that modern society has failed to recognize spiritual or theological explanations for conception, instead relying on science to provide fundamental reasons, which might allow for human intervention. The fourth paragraph is full of awkward sentence constructions.

The fifth paragraph contains a refutation of a possible objection, that is, against a non-Christian audience. The author believes that the claim for a sacred basis for life is just a part of the mystery of life's origins, which is shared by believer and non-believer alike. The author returns to the modern concerns that a pregnant woman may be faced with and compares those concerns with the same reactions that were cited in the second paragraph as being the typical

states of representations of the Renaissance artists on the subject of the Annunciation.

The sixth paragraph is the weakest of all the argument, not continuing the focus on the individual decision, but instead taking on concerns with the whole culture at large. It does little to move the argument along and seems instead to beg the question that is being responded to in the original thesis statement.

The concluding paragraph continues the refutation of the fifth paragraph, and offers an additional reason to stop abortion, suggesting that humans are like a natural resource that the planet cannot live without. The paragraph ends with a return to the scientific language which the essay began with in defense of life. At no point are any citations included to support the authority of the evidence offered.

Now we have closely read the argument from top to bottom. Let's review our criteria. For the image, we have used conventions of the graphic arts and web page design considerations. Criteria such as visual contrast, clarity of arrangement, consistency of visual patterns, moderation (simplicity), and balance are among the basic design concerns that most texts promote to create best practice compositions consisting of images, graphics, and text. All of these criteria are subject to rhetorical concerns, especially audience.

The conventional criteria for texts in freshman year composition, for example, correct semantic and syntactical construction, grammar, and organization, coherence of ideas and smooth transitions, and originality or style, with treatment of rhetorical concerns for audience have been included in our description of the argument.

The criteria contain only rhetoric in common between the two elements, the text and the image. But is rhetoric commensurable across the two modes? Ostensibly this paper is an attempt to answer that question by demonstration. For example, the description that I have made of the image is a rhetorical act, a verbal construction that offers itself as a stand-in for the image, a verbal way of representing a kind of thinking about an image(Baxandall 1985). It would not be possible to draw the image from my description, but a reader would be able to describe an image like it for themselves from description. The relationship of the text to the image is what Nelson Goodman refers to as a system of notationality, that is a sub-categorization of representation with description under denotation(Goodman 1968). So, it may be possible to relate the two rhetorics by a kind of extension of the criteria to a third realm of category, a category of in-betweenness of image and text where meaning is assembled as a rhetorical act. Before I attempt to extend anything, let's try a more conventional approach to assessing the two modes.

One solution might be to evaluate each element, the text and the image separately, and average the two scores together. This might be possible if there is a way to order the conceptual criteria in a way that is clear to the student before the composition is assigned, that is, if the ordering of one quality over another can be justified. I don't think that this is possible, not without creating such a constraint on the possibility of creativity and invention on the part of the student. How important visual contrast is compared to simplicity (moderation) of arrangement is dependent on any number of rhetorical and subjective particulars making it impossible to formulate an universal standard of order. The same problem holds true for the conceptual criteria used for the text. Certainly, I couldn't decide in advance of the rhetorical situation that the author of the document has in mind.

One possible way to evaluate the image and the text is to distinguish individual scores among the criteria, like a range of points for visual contrast, moderation, clarity, consistency, and so forth, then add up all the points. Then perform the same operation for the criteria established for the text. However, the instructor is led back to the initial problem of weighting between the two elements, because the number of criteria will have established as to which element (visual or textual) has more points available for scoring depending on the number of criteria available. To decide that there are an even number of criteria for each element is just a surrender to the idea that each element is equally influential in the rhetorical work of the document/site. So, let's just admit that we cannot easily distinguish between the value of the text and the image. We do need a third category to mediate our judgment.

Perhaps the answer is in the dynamic interplay between the image and the text. It is there that we should look for mediating factors which might demonstrate the critical thinking skills which are necessary for the selection, arrangement, and composition of the multimodal document. Some of the criteria that might be used to assess this interchange of meaning can be borrowed from Kress and Leuewen's work on images. Salience, information value, and framing are principles that address the rhetorical principles of invention and arrangement by making explicit the choices in determining the physical relation of the verbal/textual and pictorial elements of the multimodal composition. In the composition we are examining, these choices are quite limited by the MOO space which has been selected which requires that the pictorial element be confined to the top of the document and must have certain dimensions. According to Kress and van Leuewen, this position at the top of the document creates the order by which the composition is viewed and assigns an arbitrary dominant value to the image in the composition(Kress, Winkle et al. 2000; Leuewen 2003). Given this principle, the picture must provide the

"jumping off" point for the text that follows. In other words, the verbal/text must provide a justification for the image, and by justification I mean the purpose of establishing a balance of meaning to the entire document falls on the verbal/text assigned by the image.

In this particular instance, the image assigns meaning through its rhetorical power as a kind of icon of Christian memory and religious practice. Only by acknowledging the image as specific to a Judeo-Christian audience familiar with the historical context can the text hope to justify its own meaning making in counter juxtaposition to the image. In fact, this requirement to provide a hermeneutic balance to the document points towards another criteria more familiar to writing instructors, that of recursivity, a term borrowed from symbolic logic to designate for writing instructors the function of moving back and forth in planning, drafting, and revising of a document. In the way that I am using the term, recursive force is the ability of the writer to cause the reader of the verbal/text to refer back and forth to the image in a way that parallels the construction of meaning in the form of the argument.

Another term or criteria that bridges the divide between the visual and verbal/textual is exemplification from Goodman's Language of Art. By exemplification, Goodman means a quality or aspect of the representation, in this case the idea of sacred mystery that may be denoted by the image or the text. So, by categorizing sacred mystery as exemplification of the argument, then the degree to which the verbal/text and the image act as examples of the theme of sacred mystery the entire composition can be judged as obtaining a greater or lesser degree of the same quality.

Another quality which Goodman uses that may come in handy is "attenuation," which refers to articulation of the density of syntactical or semantic density within a sign system. If we treat the multimodal composition as a system in its own right, then the category of attenuation provides us with still another aspect by which the whole composition might be judged in terms that relate to the modes of text and image. In this particular aspect, attenuation refers to the ability of the text to limit its exemplification through word choices, that is by decreasing the density of meaning, the inverse of the expression of pictorial meaning by since image elements are undifferentiated from each other, that is, it is impossible to determine pictorial elements actually exemplify the meaningful property. For example, although the blue of the Virgin's robe is traditionally associated with her figure, if the color were changed, or the background color upon which it is conventionally is displayed, the exemplification of the Virgin is unchanged. The opposite of attenuation is repleteness which refers to verbal/text and its qualities as they relate to the image in semantic density, that is the properties of vocabularies operating at different levels of meaning which operate like images by providing a similarly

undifferentiated field of meaning. The verbal/textual argument in the student example displays references to the symbol (image of Virgin) and the field of reference (the mystery of life) in such a way as to provide an articulation of similar if not equal density or repleteness as the pictorial mode.

The relevance of these categories becomes much clearer when we approach the ultimate problem of judgment or assessment, that of assigning a grade. By judging the composition's interchange, that is, those properties in common within the entire composition that act as a sign system, resursiveness, exemplification, and attenuation/repleteness, we add the critical mitigating factor to assessment in addition to the conventional assessment criteria of verbal/text and image.

The author of the student text refers to the image in all but the opening paragraph, contrasting the idea of "mystery" with that of theology and science. The strategy of contrast/comparison between two ideas acts as an analog between the two kinds of interpretation that the reader must engage, that is, an interpretation of the verbal/text and the image. The calling of attention in the bulk of the argument to the image as the author does, parallels the active recursive program with which the writer is engaged. The reader is actively engaged in an act of interpretation quite similar to the challenge that the writer confronts in the composition of the document. Without direct reference to the image, the author's language calls attention to the image by its concern with a metaphorical extension of the idea of conception and annunciation. However, the author misses a great opportunity to directly involve a recursive process by failing to call attention to which of the representational states that the image signifies.

Exemplification of the idea of mystery to two figures, metaphorically that of science and faith, embodied in the verbal/text's argument, and embedded in the figures of the angel and the Virgin is also ignored by the author for the most part. The writer seems to be unaware of the correspondence between the idea of two pictorial figures and the two figures of speech that he uses in the argument of the text. If the author had been more conscious of the requirement to augment or complement the two modes, then it is likely that there would have been a greater degree of correspondence, and a greater artfulness in the text to match the image.

Attenuation/repleteness is high due to the elegant ambiguity of the figures and the density of meaning which is not constrained by the verbal/text or the image. The writer does confine the play of meaning by defining mystery as sacred and scientific, but the vocabulary is general enough to leave a dense semantic and syntactic field, that is, a variety of interpretive openings to the reader in both the verbal/text's argument and in the analysis of the image. The quality of repleteness is dependent on the interplay between the forces of

exemplification and recursivity. For example, if the author had limited interpretation of mystery to the realm or domain of the sacred, then the recursive force which is constituted by the example of the singular occasion of any woman faced with the choice of terminating a pregnancy would have been diminished in metaphorical and expressive power. The author's conscious choice of the Christian metaphorical terms, "Word made Flesh" to highlight the expressive force of the angel's presence and role in the Annunciation story makes the recursive play of image and verbal/text and subject matter especially dense in meaning.

The interchange in this play of image and text is weakened mainly by the grammatical and mechanical problems of the verbal/text, but strengthened by the strong aesthetic and subject of the image. If we should now return to the simple task of evaluating this composition we will find a much richer play of criteria to guide our assessment.

If we include the text/image interchange as a third field of analysis, then it would be possible to consider each element/mode separately and weight them accordingly. For example, it may be necessary to consider that the image in this instance is constructed by the student as a found element. That is, the process of invention was one of selection. Once the selection was made, then the text was confronted with the task of balancing the whole composition. The text is wholly constructed by the student, so the text seems to bear a greater burden than the image in making a meaningful composition which is not necessarily an unfair expectation in a freshman year composition course. This expectation obviously privileges writing over image selection.

If we decide to order the weighting of the elements by the course or curriculum or departmental standards or expectations then we should be explicit about those standards within the description of the assignment so that the students can divide their time and attention appropriately. Then, it is simply a matter of awarding so many points for each portion of the composition, the text, the image, and the interchange.

In discussions of the research that I am engaged in with my colleagues, assessment in general is criticized as a reductive science, failing to appreciate the complex phenomena of literacy, especially new and emerging literacies like the new media compositions. I understand that any analytic model which attempts to describe phenomena as I have attempted above is of necessity nominalistically reductive. However, as Goodman's terms demonstrate, labels do not of necessity limit meaning or expression, but can act as semantically and syntactically dense fields.

Composition is being forced to confront the aesthetics of composition in the new media work, and as such, the complex array of language as art will have to be judged. Aristotle made clear in his definition of rhetoric that the

author is primarily responsible for awareness of the task of composition. Instructors must know what tools are available to aid in the crucial ability of a writer to assess their own work. Assessment is at the heart of the skilled composer's craft. I hope this paper calls to mind many more criteria by which we might judge our own work and that of our students in new media composition.

Note: I am currently conducting research on this topic for my dissertation, and I would be grateful to answer any questions, or receive any advice or recommendations that you might care to give me. Please feel free to contact me at tferstle@sbcglobal.net

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Concept Mapping: How to Help Learners Visualize Knowledge

Rebecca L. Fiedler*, Eduardo Salas**
University of Central Florida

Abstract
Concept mapping is a powerful research-based strategy suitable for students across grade levels and content areas. It also has useful applications for adults in a cross-section of industries and for training. This paper addresses the theory supporting the use of concept maps and examines some of the research on using concept mapping. The authors offer practical applications of the research findings and suggest examples and additional reading for those interested in learning more.

The *No Child Left Behind Act* has mandated the use of scientifically-based research to support teaching strategies, professional development initiatives, and technology purchases in today's schools. This paper will focus on concept mapping research including definitions, theoretical support, and practical teaching strategies for the upper elementary through post-secondary classroom. It is organized around questions practitioners are likely to have.

Why is this important?

People organize their knowledge in ways that allow them to learn and store new information (Ausubel, 1963, 2000; Novak, 1998). Their underlying knowledge structures allow them to retrieve existing information and apply it to new learning and new tasks. The quality and quantity of this knowledge structure is critically important to new learning and therefore of interest to teachers and instructors. In fact, Ausubel (1963) calls this structure "the principal factor influencing the learning and retention of meaningful new material" (p. 103). Ausubel (2000) further asserts "properties of existing cognitive structure are the most important single class of factors influencing the acquisition, retention, and transferability of knowledge" (p. 146). Concept maps can make these knowledge structures explicit, sometimes revealing misperceptions that may interfere with further learning.

Concept maps, an idea conceived and popularized by Joseph D. Novak, have been used effectively in corporate training (Overmyer-Day & Benson, 1996), at colleges and universities (All & Havens, 1997; Parkes, Zimmaro, Zappe, & Suen, 2000 & Suen, 2000; Roberts, 1999; Williams, 1998), in teacher preparation programs (Ferry, Hedberg, & Harper, 1998 1998; Kowalchuk, 1999; Trent, Pernell Jr., & al, 1998 1998), and in the K-12 environment (Guastello, Beasley, & Sinatra, 2000 2000; IARE, 2003; Sungur, Tekkaya, & Geban, 2001 2001). Similar ideas have been touted among CEOs by mind mapping evangelist Tony Buzan and his popular *Mind Map Book* (Buzan & Buzan, 1996), mentioned in *Forbes, Publishers Weekly*, and other magazines. In short, researchers have found positive effects of concepts maps on student

retention and recall (Hall & O'Donnell, 1996), literacy development (Chang, Sung, & Chen, 2002 2002; Horton et al., 1993), and critical thinking in broad curricular areas (IARE, 2003).

What are concept maps?

Concept maps are alternatively called knowledge maps and mind maps. Some authors make distinctions among these, but all are similar in a number of respects. Novak (1997) defines concept maps as "tools for organizing and representing knowledge" (¶1). He goes on to specify the inclusion of concepts and connecting lines between different concepts indicating relationships. Linking lines are labeled in such a way as to form propositions or meaningful statements. Furthermore, concept maps include "cross-links" indicating the interrelatedness of different areas of the concept map. Finally, concepts are arranged in a hierarchical manner.

Others do not mention hierarchical organizations. Knowledge maps form more web-like structures that also include terms representing concepts drawn from a well-defined domain. Concepts are linked by lines and these lines are descriptively labeled to define the relationship between the concepts (Ruiz-Primo, Shavelson, Li, & Schultz, 2001). Wiegman and his colleagues (1992) define knowledge maps as "two-dimensional spatial arrays that represent information in the form of a node-link-node diagram" (Wiegmann et al.). Chung and O'Neil (1999) clarify this definition by pointing out that "nodes represent concepts and links represent relationships between connected concepts" (p. 463).

Buzan's (1996) mind maps are radiant in nature, rather than hierarchical. In a mind map, the main idea is at the center of the map with themes radiating from that central image. Branches and sub-branches form a network of connected nodes. Mind maps also rely on color and graphics.

For purposes of this paper, the terms concept maps and knowledge maps will be used interchangeably. These maps will be defined as a graphical representation of one's knowledge framework consisting of nodes and lines. Each node represents a concept and the lines express relationships. The optional label on the line defines the explicit type of relationship being represented.

What tools can I use to construct concept maps?

Concept maps may be constructed in a variety of ways and using diverse materials. Very young or pre-literate children may use picture cutouts and string yarn between the pictures to show relationships. Older students can use blank sheets of paper and colorful markers. Index cards or sticky notes that can be arranged and rearranged are also useful tools for constructing concept maps. In addition, there are a variety of software packages designed to facilitate creating and editing concept maps. Computers offer several advantages including the capability to edit, save, and print work.

Inspiration and Kidspiration software

The software packages *Inspiration* and *Kidspiration* are widely used for concept mapping and other activities requiring visual organizers. The software is designed specifically for education and features predefined templates for a number of educational activities. Users can toggle back and forth between graphic and outline views of concept maps under construction and can export their maps in a variety of formats. The Oregon-based company offers a free 30-day trial download of each product from their website at http://www.inspiration.com. Interactive demonstrations, a quick-start tutorial, and examples from a variety of curriculum areas are also posted at the website. The company offers academic pricing and volume licensing and the software is available for both Macintosh and Windows computers.

CmapTools Software

CmapTools is available at no cost to educators at http://cmap.ihmc.us/download/. The newest version of the product is currently available for Windows, Linux, and Solaris platforms. Work to release the software of Macintosh OS X is ongoing. Developed at the Institute for Human and Machine Cognition at the University of West Florida, *CmapTools* offers the ability to create concept maps, to share them using Internet technologies, and to work collaboratively to construct maps.

Mind Manager

Available for Windows computers only, *Mind Manager* is targeted to the business customer. *Mind Manager* promises seamless integration with Microsoft *Office* and *Project* products. Additional capabilities include a variety of modes and the ability to export to a variety of file formats. A free 21-day trial download is available at the company's website (http://www.mindjet.com), along with several tutorials and case studies.

What is the theoretical support for concept mapping?

Ausubel's Assimilation Learning provides a theoretical foundation for concept mapping (Novak, 1998). According to Ausubel (2000) learners must be presented with "potentially meaningful material" and they must have a cognitive structure to anchor or connect the new ideas in order to form new meanings. New knowledge is placed in the existing organizational structure and new meanings are formed. These new meanings are formed by interaction between old and new knowledge. The newly acquired knowledge modifies the old knowledge, and vice versa. Over time, the new knowledge is subsumed by the existing knowledge structure.

This subsumed knowledge prepares learners to more easily learn additional, related information (Novak, 1998). "If existing cognitive structure is clear, stable, and suitably organized, it facilitates the learning and retention of new subject matter. If it is unstable, ambiguous, disorganized or chaotically organized, it inhibits learning and retention" (p. 103). In fact, the learner's prior learning and resultant cognitive structure is the most important consideration in whether or not meaningful learning will occur.

For purposes of training and teaching, an understanding of the novice learner's structure is useful in order to present potentially meaningful material. Facilitating the development of an appropriate cognitive structure maximizes the likelihood of meaningful learning and retention (Ausubel, 1963).

Ausubel's view is consistent with the Information Processing model of learning. Neurocognitivists interpret learning as an active process where new learning is integrated into existing knowledge structures that have been idiosyncratically constructed based on prior experiences. These structures of prior experiences influence how new experience and newly acquired knowledge will be stored in long-term memory. Arousing these networks of stored knowledge by activating prior knowledge is a critical condition to facilitate new learning (Anderson, 1992, 1997).

Information processing models suggest existing ideational networks are activated when there is new input. Further, the analysis of the new input is mediated by the prior existing conceptions to provide a context for the new input. Information processing research indicates "new learning tasks involve a reconstruction process of assembling information from fragments in memory that are pertinent to the context of the task" (Anderson, 1997 p. 80). Further, Anderson asserts "these networks may be the neurocognitive equivalents of schemata in psychology" (p. 86).

From a theoretical perspective, concept maps can facilitate learning by making cognitive structures explicit. The process of completing maps forces the map constructor to think specifically about the relationships within a given domain. Misconceptions may also surface, providing instructors opportunities for correction.

What does the research say about using concept maps?

A thorough literature review is beyond the scope of this paper. Readers interested in a comprehensive literature review have two readily-accessible options. Cañas and colleagues at the Institute for Human and Machine Cognition (2003) prepared a summary of literature for the Navy. They reviewed the use of concept mapping (as defined by Novak) in education, business, and government. Their major conclusions included: the idea that it is better to integrate concept map use in the learning process, rather than incorporate it in isolation; that concept mapping is especially useful for learning about relationships between and among concepts; that a broad cross-section of students, including those of lower ability, can benefit from concept mapping; that there are numerous uses for concept mapping in the field of education; and that learners must actively interact with the subject matter under study to maximize achievement.
In a study commissioned by *Inspiration* software, the Institute for the Advancement of Research in Education (IARE, 2003) identified 29 studies that meet the *No Child Left Behind Act's* definition of scientifically-based research. From their review of these studies, they concluded that visual organizers improved student performance in reading comprehension; enhanced thinking and learning skills; and improved retention and recall of information. They also noted increased student achievement across grade levels and content areas.

The rest of this paper will focus on the findings from specific research studies with direct application to today's classrooms.

What effect, if any, does concept mapping have on student perceptions?

Hall and O'Donnell (1996) examined subjective perceptions such as anxiety, motivation, and concentration of subjects in an experiment using university students (n=43). Researchers also examined differences in objective, cognitive outcomes related to recall. Subjects studied a 1,500-word passage on the autonomic nervous system. Some subjects studied a text passage, while others received the information in the form of a knowledge map. Throughout the experiment, subjects rated themselves on anxiety/nervousness, motivation, and concentration. Two days later, subjects completed a free recall test in which they were asked to recall as much information as possible from their studying.

Results indicated a significant positive effect on both motivation and concentration during the study session. This effect favored knowledge maps. There was no significant difference between the knowledge map and text groups on ratings of anxiety. Ratings of motivation during the testing session were not significant. Ratings on concentration were higher during the study session than during the testing session.

Recall results favored use of knowledge maps. The favorable effect was evident in both superordinate and subordinate propositions, but most pronounced in recall of superordinate information. Researchers suggested the structure of the maps provided emphasis on the macrostructure of the content to be learned (Hall & O'Donnell, 1996).

What does this mean for your classroom?

Those who used knowledge maps during the study session were more motivated to study and better able to concentrate. Not surprisingly, this resulted in a better performance on the recall test a couple of days later. Subjects were able to remember both large and small ideas from their study materials. The most pronounced improvement was in their recall of the bigger ideas.

Are there any suggestions for designing concept maps?

The design and configuration of concept maps influence students' using them. Researchers have examined design questions such as spatial configuration, whole maps versus stacked maps, and plain versus embellished links (Wiegmann et al., 1992).

In an experiment involving 37 university students, subjects were given two different types of maps. The first group received a map designed as a hierarchy in which gestalt principles of symmetry and proximity were applied. The second group studied a map organized with the topic node at the center, with supporting nodes surrounding. This map resembled a "spider web." Maps were informationally isomorphic and both contained embellished (or labeled) links. Subjects in the "gestalt map" group outperformed those who studied the web map on both a fill-in-the-blank test and a multiple-choice test.

Most concept maps are formatted as a single, large map. These are called "whole" maps. Alternatively, large complex maps may be broken into more manageable chunks. Such maps are presented sequentially. To determine the relative effectiveness of these map formats, 34 university students were given maps with information about human biology. One group of subjects received a whole map containing embellished links. Gestalt principles of organization were applied. The second group of subjects received a series of six stacked maps. Subjects were randomly assigned to treatment groups and studied their maps for 20 minutes.

After one day's delay, subjects returned to take a short answer and a multiple-choice test. Both groups took each test. The short answer test was administered first to eliminate cueing from the first test. Results from this experiment indicate that subjects with high verbal ability performed better with the stacked map format. This same format hindered the low verbal ability subjects.

In contrast, those with lower verbal ability performed better with the whole maps, while the higher verbal ability subjects' performances suffered. The map format had a greater impact on the short answer tests than the multiple-choice test. The researchers suggest this effect is due to the higher demands placed on the retrieval processes.

Another experiment conducted by these same researchers compared the performance of subjects using maps containing plain links to that of subjects using maps with embellished links. Embellished links contain arrowheads to show direction, words or abbreviations to label the lines, or differently drawn lines (solid, dashed, barbed) to indicate various types of relationships. Embellished links do not necessarily exhibit all of these characteristics simultaneously.

Thirty-one university students participated in the experiment examining links. Subjects studied stacked maps that were organized according to gestalt principles. One group of subjects studied maps with plain links, while the other group examined maps with embellished links. The next day subjects were administered a free recall and a multiple-choice test, in that order. In this experiment, higher ability students' performance was facilitated by embellished links while lower verbal ability subjects' performance was hindered. Conversely, lower verbal ability subjects' performance was enhanced using maps with plain links while the higher verbal ability subjects' performance was hindered.

What does this mean for your classroom?

Researchers found students studying a hierarchical map following principles of symmetry and proximity outperformed students studying a map organized more like a spider web on fill-in-the-blank and multiple-choice tests. This suggests that when creating concept maps to share with students, a hierarchical structure should be used.

Consider providing a "whole" map to convey a broad idea for low ability students, though this is not helpful to high ability students. High ability students are better served by a series of "stacked" maps presented in a logical sequence. However, low ability students do not benefit from the "stacked" maps. Where possible, offer "stacked" maps to high ability students and "whole" maps to low ability students.

Researchers have found similar results with linking. High ability students benefit from embellished links conveying additional information, though these are overwhelming for low ability students. Plain links are beneficial for low ability students, but a hindrance to high ability students.

How do I use concept maps in my classroom?

Researchers have examined a variety of methods for using concept maps. These include the use of concept maps as advance organizers, teacher versus learner prepared maps, and different strategies for providing expert maps to learners.

Are advance organizers valuable?

"Advanced organizers refer to a category of activities such as outlines, text, aural descriptions, diagrams and graphic organizers that provide the trainee with a structure for the information that will be provided" (Cannon-Bowers, Rhodenizer, Salas, & Bowers, 1998 p. 298). Such advance organizers have been used in a variety of training and educational contexts including the military (Kraiger, Salas, & Cannon-Bowers, 1995) and foreign language instruction (C. Herron, 1994; C. A. Herron, Hanley, & Cole, 1995; Tripp & Roby, 1990), among others. Advance organizers have been the focus of researchers' attention since Ausubel introduced the idea in the early 1960s.

Richard E. Mayer (1979a) performed an exhaustive search of advance organizer studies completed after 1960. Based on his selection criteria (published in a journal or book and research design including a control group), 44 studies were selected for further analysis. Mayer concluded that advance organizers offer the largest benefit when used in a domain in which the learner does not have, or does not use, a framework for assimilating the knowledge. Further, benefits to using an advance organizer will occur when the material is disorganized or unfamiliar to the learner. Achievement on tests measuring broad conceptual learning or requiring transfer to related tasks is favorably impacted by the use of advance organizers. "Twenty years of research on advance organizers has clearly shown that advance organizers can affect learning, and the conditions under which organizers are most likely to affect learning can be specified" (Mayer, 1979b, p. 161).

Of interest to practitioners are six specific themes that have emerged in research on advance organizers: acquiring concepts, reading comprehension, organization of material, effects of repetition, learner perceptions, and graphics. Each is briefly addressed below.

Acquiring concepts. Mayer (1979a) and Hannafin and Hughes (1986) have concluded that advance organizers and diagrams help learners acquire concepts in meaningful ways. Students are better able to make novel inferences, generate creative solutions, and improve their performance on far transfer tasks.

Reading comprehension. Mayer (1984) and Mayer and Bromage (1980) examined advance organizers to aid reading and text comprehension. They concluded that advance organizers positively affected the number of conceptual idea units recalled and learners' ability to perform far transfer tasks. Hirumi and Bowers (1991) studied the impact of concept trees, a

graphical advance organizer, on comprehension and perceived motivation of college students performing a reading task. They found increased acquisition of concepts, a higher perceived level of motivation, and more student confidence in completing the reading task.

Organization. Mayer (1978) investigated the role of advance organizers on learning. His assertion was that advance organizers provide a meaningful context for integrating new material. To test this theory, he used college students who were given complex text. The experimental group received an advance organizer and the control group did not. In an experiment with logically organized text, followed by questions closely related to the text, the advance organizer group had no positive effect. In contrast, subjects in another experiment were given poorly organized text and a post-test that was not closely related to the subject matter of the text. In this case, the advance organizer group performed significantly better than the control group.

Repetition. Mayer (1983) found results to support that repetition increases performance on recall tasks. Subjects were scored on recall of idea units, verbatim recognition, and problem solving. Additionally, Mayer found that repetition also impacts in a qualitative way; more conceptual learning, along with problem-solving ability, takes place. Advance organizers seem to have the same effect as repetition in allowing subjects to build a conceptual framework for their learning (Mayer, 1983).

In an attempt to extend and replicate the previous work on repetition, Kiewra, Mayer, Dubois, Christenson, et al. (1997) compared the use of advance organizers to repetition of videotaped learning material. They used novice students to compare different types of organizers and repetition of a lecture one, two, or three times. Subjects were tested on recall, relationships, and facts.

Results indicated better recall for the conventional organizer, but only for main topic information. This was unexpected. For the relationship test, the more detailed organizers resulted in a positive difference. Further, results indicated a positive effect on the organizers that was related to the criterion task (Kiewra et al., 1997).

Perceptions. Hirumi and Bowers (1991) examined perceived levels of motivation and confidence among college students completing a reading task using concept trees. They found an increased perceived level of overall motivation. Students in the experimental group reported significantly higher levels of confidence than their counterparts in the control group (Hirumi & Bowers, 1991).

Graphics. There is research support for using graphical or pictorial advance organizers. Herron, Hanley, and Cole (1995) compared two advanced organizers in second year French classes at a college. In one treatment condition, students heard an aural description setting the scene for a videotaped conversation that was going to be played. The other treatment group listened to the same aural description and were simultaneously presented with representative pictures. The description + pictures treatment yielded significantly better scores on comprehension tests. Additionally, 100% of the students reported a preference for the description + pictures treatment (Herron et al., 1995).

Mayer (1989) examined the use of conceptual models to aid scientific understanding. In his review, he found significantly stronger performance in the areas of conceptual information and transfer problems. In fact, he replicated these findings using a variety of reading tasks across a range of scientific concepts. Students who had received a model prior to instruction outperformed those who had not.

What does this mean for your classroom? Advance organizers provide a small but consistent advantage to learners using them. These advantages are more marked when unfamiliar material is provided, the material is poorly organized, when learners are novices, or when the test measures transfer (Mayer, 1983). In situations where the learner is immersed in an unfamiliar domain, or confronted with dense or disorganized text, the advance organizer may have the effect of increasing understanding.

When the goal of the materials presented is to develop higher order thinking or problem solving among learners, an advance organizer should be an effective tool to help learners acquire key concepts. These concepts are critical to reach problem-solving goals, make novel inferences, and successfully complete far transfer tasks.

Should concept maps be teacher-generated or student-generated?

Smith and Dwyer (1995) assessed the effectiveness of instructor-prepared and learner-generated concept maps in facilitating student achievement. In this study, the primary mode of learning was reading the text. Researchers wished to determine whether there is interaction between prior knowledge, and instructional strategy. This study assigned 81 college students to three different treatments. All participants read a passage about the heart and were tested in a variety of ways: drawing, identification, terminology, and comprehension. Treatment 1 was to read only. Subjects in Treatment 2 read the text and generated concept maps. In Treatment 3, the instructor prepared the concept maps in addition to the student's reading of the text. Results were positive, but not significant for instructor-prepared maps.

What does this mean for your classroom? Researchers recommend that instructor-prepared maps be accompanied by a thorough explanation (Smith & Dwyer, 1995).

Are there effective strategies for presenting concept maps to students?

Chang, Sung, and Chen (2002) explored the effectiveness of concept mapping in enhancing text comprehension. Researchers attempted to correct for the passiveness that may be a byproduct of providing expert maps to students. They also recognized that having subjects construct their own concept map might result in cognitive overload. To correct for these problems, they used scaffold fading, a completion strategy, and a map-correction approach to examine the effect of concept map training on summarization skills.

Participants for this study were 126 fifth grade students (60 girls and 66 boys) in Taipei. Class groups were assigned intact to the three experimental groups and a control group. There was a pre- and post-test, along with 7 weeks of instruction on reading and map construction. The dependent variables were text comprehension and summarization.

The researchers used seven examples of scientific writing, each reviewed by two 5th grade teachers to determine suitability. In all analyses, the map correction group out-performed the other groups. The researchers discuss the possibility that the failure of the scaffold fading and map generation groups to outperform the control groups may be due to the complexity of the task (as reported by the subjects) and the resulting cognitive load or insufficient training time for the learners to develop the required skills. The findings suggest the use of map correction as a potential approach to the effective use of concept mapping (Chang et al., 2002).

Training effects were also noticed as subjects trained in concept mapping techniques transferred these skills to novel situations, especially summarization. Only the scaffold-fading group significantly outperformed the control group in the summarization test.

What does this mean for your classroom? Concept maps are useful to scaffold students' understanding of complex material. As they become more familiar with the domain under study, the maps can become less detailed and eventually fade completely. Implementing in this manner may improve students' ability to summarize important ideas. Additionally, asking students to correct concept maps is an effective approach to use concept mapping.

How can concept maps be used to assess students?

Using concept maps to compare novice conceptual understanding to expert understanding has generated substantial research interest. Researchers have determined this is a useful undertaking.

The first study took place in the Calculus domain. Eight professors and 14 students participated in the study. Qualitative analysis of the concept maps they generated revealed substantial differences between the novice maps and the expert maps. The researcher was able to determine subtle differences in understanding among the students and noted homogeneity among the experts' maps (Williams, 1998).

In an attempt to develop more effective measurement systems for individual cognition using concept maps, Aidman and Egan (1998) turned to computers. Their study involved two professors and 100 first year psychology students. Researchers presented eight concepts to the two professors. These professors developed "expert" maps. Students mapped the same concepts and student maps were compared to the "expert" maps as well as to student performance on a standard test. Researchers found there was high reliability between the experts' maps. Student maps could be divided in four different groups according to mapping performance: expert, novice, mixed, and other. Student maps were consistent with the students' academic performance. Researchers concluded that implicit maps can be reconstructed and compared to experts. They further concluded that maps can indicate differences between learners (Aidman & Egan, 1998).

Identifying the misconceptions students hold is important so these misconceptions do not interfere with future learning. In a 10^{th} grade science class, researchers used concept mapping to examine misconceptions. An experimental group (n=26) used concept maps, while the control group (n=23) was taught using traditional instructional methods. The period of treatment was five weeks. The study found a positive effect on students' understanding of concepts through the use of concept mapping (Sungur et al., 2001).

Bolte (1999) looked at student-generated concept maps and essays to assess students in three undergraduate math courses. Their primary objectives were to measure correlation between concept map scores in conjunction with essays and those of exams and course grades. Additional objectives included measuring students' perceptions of this approach along with assessing the "connectedness" of students' knowledge.

Subjects included 108 undergraduate students enrolled in three different courses. Results allowed instructors and researchers to identify misconceptions held by the students, and the researchers concluded the combination of concept maps and accompanying essays was more powerful than either approach individually. Statistical analysis showed a significant correlation with more traditional measures. Students perceived their learning was enhanced in numerous ways because of the creativity involved, the reflection required by the task, and the encouragement they received to modify and extend their knowledge in order to construct the map. Bolte (1999) concluded the combination of concept maps and essays is a worthwhile addition to more traditional assessment methods and that it is no more subjective than traditional methods. Students' reactions were positive.

The practicality of implementing a new and time-consuming form of assessment is a legitimate issue for practitioners to raise. McClure, Sonak, & Suen (1999) attempted to assess practicality, along with reliability and validity. They compared six different scoring methods using 63 undergraduate education majors with 12 graduate students serving as scorers.

Participants received 90 minutes of instruction on concept mapping. Instruction included three guided tasks of increasing complexity. McClure and his colleagues (1999) concluded the use of concept mapping was very feasible for classroom application. Instruction and scoring was no more time consuming than typical assessment tasks. They further concluded that concept maps produced useful results for the classroom teacher.

Finally, Ruiz-Primo et al (2001) examined three types of concept maps: construct-a-map, fill-in-the-nodes, and fill-in-the-blank. They asked subjects (experts, expert students, and novice students) to talk aloud during the concept mapping task in order to understand the thinking process that was occurring. Subjects included two high school chemistry teachers and six students. Each subject completed each mapping task using the talk aloud protocol. The topic was chemical names and formulas. The researchers examined inferred cognitive activities through verbalizations and did empirical analysis of performance scores.

The primary purpose of this study was to develop a system or protocol for examining the claims of cognitive validity of concept mapping as an alternative assessment technique. Tasks ranged from high-directed to low-directed across the three different concept mapping techniques.

The researchers concluded fill-in-the-lines maps were cognitively more difficult than fill-in-the-nodes maps. Construct-a-map from scratch provides the best differentiation of respondents' knowledge. The greater latitude allowed respondents to show their knowledge as well as misconceptions. The small sample size (n=8) yielded 24 verbal protocols to analyze. Researchers cautioned that generalizing the findings of this study should be done with caution (Ruiz-Primo et al., 2001).

What does this mean for your classroom? There are several ways concept maps can be used to assess student learning. Some of these may be too complex to objectively score for routine classroom use. At a minimum, student-generated concept maps are likely to reveal misconceptions held by students. This information is useful to instructors interested in designing interventions for students and modifying instruction to "fix" misconceptions. Student-generated concept maps will vary in quality and these differences are likely to correspond with other measures of student achievement. Though not the most effective use of concept mapping, several map completion strategies (fill-in-the nodes, link labeling, and fill-in-the blanks) may prove useful for assessment purposes.

Can concept maps be used for organization and planning?

Two studies (Ferry et al., 1998; Kowalchuk, 1999) have examined using concept mapping to assist preservice teachers in curriculum issues and planning. The first study used concept maps to examine the knowledge structures of preservice art teachers, and the second investigated how concept mapping can be used to plan and organize a science education curriculum.

In the first of the two studies, Kowalchuk (1999) addressed four issues: the influence of a published lesson plan, possible variations in approaches to a single published lesson plan, examination of concept maps to gain insight into novice art teachers' thinking about instruction and learning, and the potential usefulness of concept maps to examine and facilitate thinking.

The subjects were 18 art education majors enrolled in a curriculum and instruction class at a Midwestern university. Participants received a published art lesson plan researchers believed would provide ample opportunity for rich concept maps. After a brief training period, participants were asked to create their own maps using the published plan and drawing on their own expertise. They were encouraged to make cross-connections and draw on personal expertise. All participants completed their maps within one hour.

Kowalchuk (1999) examined subjects' perceptions of relationships between content, pedagogy, learning, and other factors. He found the maps lacked complexity. His recommendations included future research to exam the compartmentalization of novice teachers' knowledge in order to address the problem of simplistic thinking despite a relatively rich art background, cognitive flexibility, and the uncritical acceptance of published art lessons.

In the second study, researchers examined how preservice teachers used a concept mapping tool to organize a science education curriculum. The research questions for the study were: “How do preservice teachers use computer-based concept mapping tools to organize their curriculum content knowledge?” and “What features of the computer-based concept mapping tools help preservice teachers to link effective instruction with curriculum content knowledge?” (p. 88).

Subjects in this study used computer-based concept mapping tools. Two tutorials were held before subjects were asked to make their final concept maps. Researchers analyzed changes in software features that subjects used by comparing the first round of maps to the second. An increase in the number of links was found, as well as the use of the notes feature to describe pedagogical ideas for concept-specific nodes.

Subjects reported comfort with the process of concept mapping and using the computer. Follow-up studies with 21 of the subjects indicated they continued to use concept mapping as an instructional planning strategy. Researchers found enhanced planning skills, suggesting that the process of completing the concept map enhanced plan might be more important than the product itself (Ferry et al., 1998).

Jamie McKenzie (2003) has written about using *Inspiration* software as a tool for investigating complex issues. In his article, McKenzie discusses mind mapping strategies to explore complex questions and note taking strategies to record information. The paper you are reading was organized and written using the strategy described by McKenzie and the resulting diagram is illustrated in Figure 1.

What does this mean for your classroom? Teachers and students alike can benefit from the use of concept mapping to plan complex tasks such as lesson planning, papers, websites, and multimedia projects. Use of computer software allows the flexibility to easily edit and reorganize. Different software packages offer a variety of features including note taking, commenting, outlines, and exporting to simplify complex tasks.

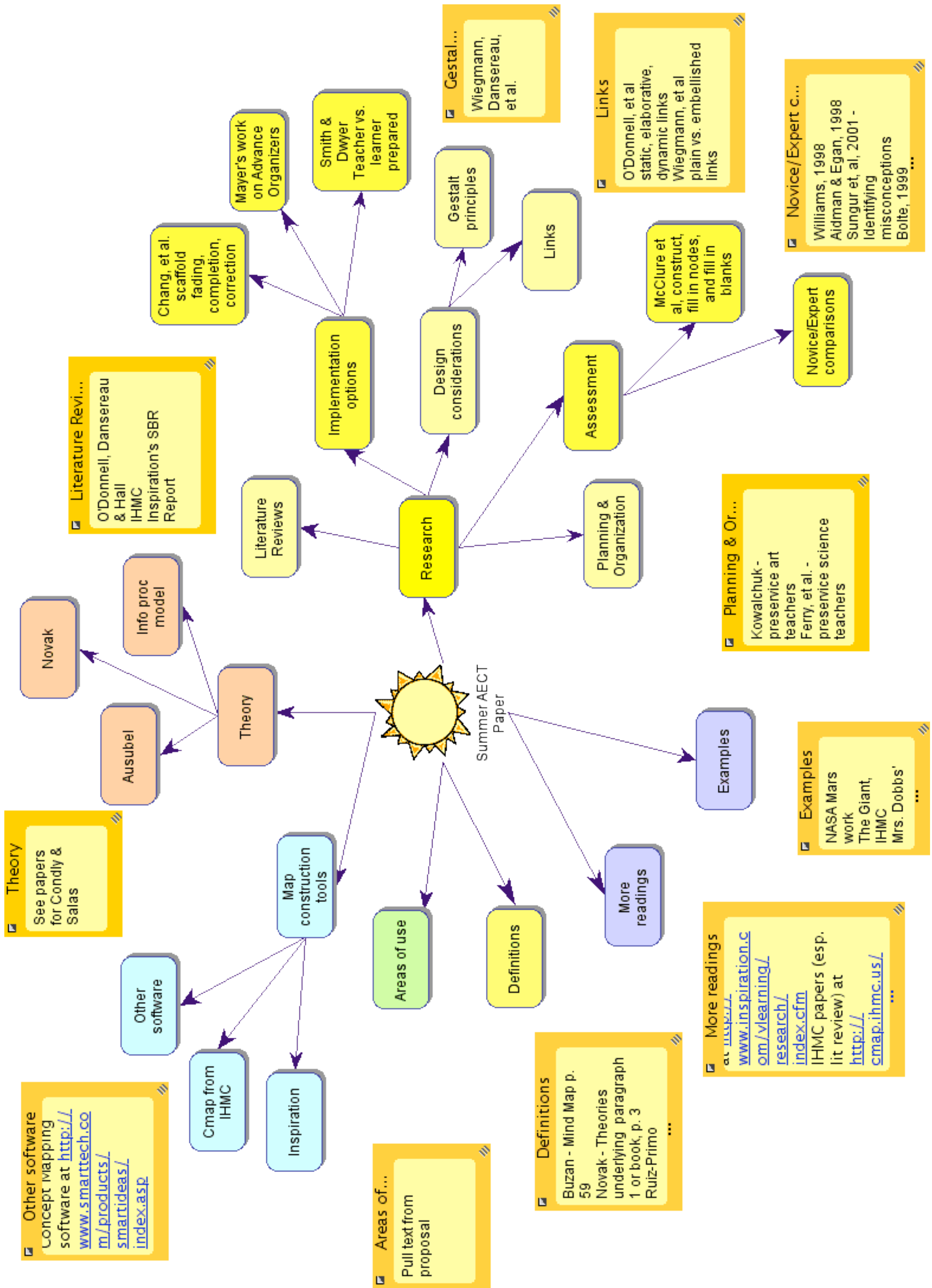

Figure 1. Inspiration diagram of this paper

Where can I see examples of concept maps and how they are used?

A variety of concept maps, illustrating many of the ideas in this paper, are available on the World Wide Web. Far from comprehensive, the following list offers several maps in a variety of styles used for a variety of purposes.

Mrs. Dobbs's Social Studies class website (http://home.earthlink.net/%7Etsdobbs/) hosts a colorful array of student generated samples. All are examples of "whole" maps. None are hierarchical.

NASA and the Institute of Human and Machine Cognition (IHMC) have collaborated to create Mars concept maps (http://cmex.arc.nasa.gov/CMEX/Map%20of%20Maps.html). This is an example of "stacked" maps that are hierarchical in nature. The maps have elaborative links and are used for website navigation. IHMC's website at http://cmap.ihmc.us/ offers another example of "stacked" maps with elaborative links used for website navigation.

Michael Ruffini's *MapACourse* website (http://www.mapacourse.com/FlashMX%20html/MJFlashMX.html) uses *Mindjet's Mind Manager* software to organize course materials and provide navigation to the materials. This is an example of a "whole" map with plain links.

Concept maps for study and instruction are available for statistics (http://cmap.coginst.uwf.edu/cmaps/MDM2/), biology (http://www.fed.cuhk.edu.hk/~johnson/misconceptions/misconceptions.htm), and as a pre-writing strategy (http://slc.otago.ac.nz/studyskills/conceptmap.asp). *Inspiration* and *Kidspiration* have posted examples in math, science, language arts, social studies, multimedia and lesson planning at http://www.inspiration.com/vlearning/index.cfm?fuseaction=example.

How can I learn more?

Michael Zeilick has created a tutorial in using concept mapping as part of the *Field-Tested Learning Assessment Guide* for science, math, engineering, and technology instructors. This brief tutorial is available at http://www.flaguide.org/cat/minutepapers/conmap1.php.

Joseph D. Novak (1997) has a brief paper *The Theory Underlying Concept Maps and How to Construct Them* posted at http://cmap.coginst.uwf.edu/info/. He has also written two books: *Learning How to Learn* (Novak & Gowin, 1984) and *Learning, Creating, and Using Knowledge: Concept Maps as Facilitaivte Tools in Schools and Corporations* (Novak, 1998).

Tony Buzan's *Mind Map Book* (Buzan & Buzan, 1996) offers another popular approach to creating maps of knowledge.

Conclusion

The powerful concept mapping strategy is suitable for students and teachers of all ages. It offers a motivating activity to increase student achievement across the curriculum and in such areas as problem solving, retention, recall, and comprehension. It is a powerful planning and organizational strategy for both students and teachers. Concept mapping is supported by scientifically-based research, thereby opening funding sources offered through *No Child Left Behind*. Concept mapping is easy to learn and easy to teach. Put it to work in your classroom tomorrow!

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Constructive Controversy in Asynchronous Time

Ludy (Ludwika) Goodson
Web Course Designer
Office of Distributed and Distance Learning
Florida State University

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Abstract – When preparing for the delivery of a face-to-face course in an online environment, philosophical choices will direct the design of the process and, therefore, control the learning outcomes for the students. People may choose *tradition*, *technology* or *instructional design* as the primary driving force in design decisions. As a result of these decisions, course materials and assignments can be *transmitted* in similar formats to those used in the *face-to-face* environment, can be *converted* into different media that mirror the face-to-face class, or can be *transformed* into applications of technology that match the progression of the learning outcomes expected for course. In making choices for developing complex cognitive skills, the progression of the assignment ought to match the progression of skill development. Following a brief review of literature on engaging constructive controversy, examples of transmission and conversion will be explained, but the primary focus will be on a course using a jurisprudential model of teaching in order to illustrate the transformation features. Design elements include the progressive complexity of the constructive controversy assignment in asynchronous time, the features that produce individual and team responsibilities and the features that place more management control with the students.

Introduction

This paper will include a review of approaches for using the jurisprudential model of teaching to create constructive controversy among competing teams in asynchronous environments, and will answer the following questions. What kind of assignment would develop the prerequisite concepts in progressive complexity so that the students would be able to engage in constructive controversy in asynchronous time? What kind of structure would reduce the instructor's course management load? How do the features of the final assignment compare to other alternatives?

Strategic Decisions

Design of the course on Media Legalities did not begin with the intent of developing a major assignment for *constructive controversy in asynchronous time*. It began with observing the face-to-face class across three sessions and several major assignments presented and discussed during class sessions.

The lead faculty, Dr. Pat Hadley, had a legal background and teaching assignments, but no prior experience with learning and teaching in the online environment. In addition, Dr.

Hadley wanted to create a new course, different from the one the web course designer was observing.

During and between course observations, the web course designer pursued finding the *real goal*(s) after learning that course objectives in the syllabi tended to be those approved by committees, and might not be the same ones directly covered by the instruction. While those objectives would express *institutional goals*, they might not express the more explicit *enabling objectives* of a particular course. In planning the design of a new course, finding the *real goal*(s) of the teaching process would allow the creation of more explicit statements in the course materials so that the students would have accurate expectations about what they would learn in the new course.

The faculty's and web course designer's exchange of ideas and interactions about the style and function of the course, the experiences of the students (users), and the satisfaction of the faculty (client), (Winograd, 1996) would define the form and function of the course. Conceptualizing how the structure of the course can be represented in the online environment requires identifying the main elements, their relevancy, and their relationships to each other and to the students across the course interface.

When preparing for the delivery of a face-to-face course in an online environment, philosophical choices will direct the design of the process and, therefore, control the learning outcomes for the students.

People may choose *tradition*, *technology* or *instructional design* as the primary driving force in design decisions. As a result of these decisions, course materials and assignments can be *transmitted* in similar formats to those used in the *face-to-face* environment, can be *converted* into different media that mirror the face-to-face class, or can be *transformed* into applications of technology that match the progression of the learning outcomes expected for course.

Following *tradition*, the faculty and web course designer, would have taken the old course and posted the same content and the same kinds of activities in the online interface. Alternatively, they would have taken the examples from other courses in the unfamiliar technology interface and modeled the layout and progression of content to mimic the same template. Both options follow a form of tradition and would produce the *transmittal* of the course for online-viewability and access, or would mirror the face-to-face content by plopping it in media formats, such as PowerPoints that were never intended for one-person-viewing online. This kind of production would be more like placing the text of a novel on a screen instead of creating a more meaningful visual and auditory experience.

Following the *technology-driven* option would have meant building many chat activities into the course assignments, not because these activities were the best choice for learning, but because they were excellent working features in the technology. Even though the faculty and web course designer explained the need for *working students* to have flexible asynchronous time, the technology representatives continued to endorse the success of the chat feature and encourage its use.

Similar examples sometimes prevail when administrators push for the fit of courses into pre-established templates with micromanaged guidelines of how and when to use them. From some perspectives, it would be more cost-efficient to give the faculty member a template and meet periodically to review, evaluate, and revise progress. Use of this choice was confounded by the requirement to use a course interface with which both the faculty and the web course designer were unfamiliar.

The faculty and web course designer for Media Legalities, chose a different path. It would be less efficient. It would have more power for learning. The instructional analysis would lead the way for the application of the technology.

The process for designing the new course would engage instructional analysis integrated with review of the *teaching model* used by the faculty and *real goal*(s), prior lectures, prior test items, prior assignments, new books about media legalities, reference books on related legal issues. Following the instructional analysis, the lead faculty and web course designer would articulate the new course objectives, explain the teaching philosophy and course expectations, and create new assignments and methods of assessment.

	Tradition and Technology Perspective		**Technology Driven**	**Instructional Design and Technology**
Approach	Transmit course content	Mirror course content	Reshape course teaching process	Transform Course Content and Learning
Process	Put same content files, assignments, and tests to access online; no redesign	Plop content into media formats without analysis and redesign	Make teaching process fit the technology	Define learning processes and design web activities to use technology to fit learning needs
Result	Loses interaction	Loses interaction	Loses course integrity	Keeps content integrity; uses media that fit; builds interactions

Using a course interface adds another dimension to teaching. The term *interface* implies that we are looking at both person and machine and the space that lies between and the interaction design process *requires a shift from seeing the machinery to seeing the lives of the people using it* (Winograd, 2003). This is the challenge we face in designing e-learning. For this course, learning design was discussed and articulated in decisions about course elements, phases, and total course experience.

Learning Design Elements

The *critical thinking process* requires an attitude of suspended judgment, logical inquiry, problem solving, and evaluative decision or action (National Council on Teacher Education's [NCTE] Committee on Critical Thinking and the Language Arts as cited in Carrol, n.d.). It includes skillful, responsible thinking that facilitates good judgment, relies upon criteria, is self-correcting and sensitive to context (Lipman cited in Legg, 1990). It involves skepticism, curiosity; questioning of beliefs, aims, definitions, conclusions, actions, appraisal of frameworks or sets of criteria by which judgments are made (Patrick, 1986).

Higher order thinking requires understanding of facts, concepts, principles, and procedures (Haladyna, 1997). It includes analysis, synthesis, and evaluation (Bloom, 1956). *Inquiry* requires investigating beliefs or forms of knowledge, taking care to consider the grounds that support them and the conclusions drawn from them (Dewey, 1933). *Problem solving* requires application of more than one rule/more than four concepts to solve problems to situations with multiple variables, multiple relationships (King, Rohani, & Goodson, 1997). It combines two or more rules to solve a problem (Gagné, Briggs, & Wager, 1988). Rational thinking requires the interdependent skills of creative thinking, critical thinking, and problem solving (Ennis cited in Lewis & Smith, 1993).

Supports for learning how to think include *schemata* — these are systems of relationships between concepts (Crowl et al., 1997); complex networks of related knowledge

(Rumelhart cited in Costa, 1990); cluster of knowledge associated with a type of problem, and typical solution procedures (Gick & Lockhart, 1995). *Scaffolding*, requires a balance of support and guidance gradually removed until the student can work independently (Rogoff; Rogoff, Malkin, & Gilbride cited in Crowl et al., 1997). Finally, finding ways to help students assess and regulate their own thinking can help develop more complex thinking skills (Crowl et al., 1997). The process of *metacognition* includes the application of known heuristics and steps for thinking. Student success with metacognition depends, in part, on a personal belief that one can "get smarter" as well as the beliefs of others, such as teachers (Crowl et al., 1997).

Direct instruction (teacher-centered presentations of information) should be used sparingly (Crowl et al., 1997) with short presentations (up to five minutes) (Kauchak & Eggen, 1998) and coupled with guided practice to teach subskills and knowledge.

Teacher- and/or student-generated questions about dilemmas, novel problems, and novel approaches should elicit answers that have not been learned already (Crowl et al., 1997; Kauchak & Eggen, 1998). Student responses should be followed by sincere feedback providing immediate, specific, and corrective information should inform them of their progress.

Small group activities such as student discussions, peer tutoring, and cooperative learning can be effective in the development of thinking skills. Activities should involve challenging tasks, teacher encouragement to stay on task, and ongoing feedback about group progress.

Computer-mediated communication and instruction can provide access to remote data sources and allow collaboration with students in other locations. It can be effective in skill building in areas such as verbal analogies, logical thinking, and inductive/deductive reasoning.

In the teaching of higher order thinking skills, especially in the online environment, instruction must include particular clarity of communication to reduce ambiguity and confusion and improve student attitudes about thinking tasks. Lesson plans should include modeling of thinking skills, examples of applied thinking, and adaptations for diverse student needs. Scaffolding (giving students support at the beginning of a lesson and gradually requiring students to operate independently) helps students develop higher order learning skills. However, too much or too little support can hinder development. In addition, it is useful to remember that content mastery and lower-order thinking skills are particularly important prerequisites to higher order thinking according to Gagné, Briggs, and Wager (1988)

The approach to learning design elements parallels the Mid-continent Research for Education and Learning (**McREL**) philosophy:

- maintain a focus on learning;
- study the learning process; and
- plan curriculum, instruction, and assessment that take into account the five critical aspects of learning.

Those five aspects, from Marzano's dimensions of learning include developing attitudes and perceptions, acquiring and integrating knowledge, extending and refining knowledge, using knowledge meaningfully, and productive habits of mind (Marzano et al, 1997; Marzano, n.d.). These are dimensions that interact in the teaching and learning process.

Teamwork Design Elements

Group size must be limited to six or fewer for group work to remain manageable and focused. Before they can work well in teams or groups, students must learn skills such as listening carefully, maintaining focus, and providing support and encouragement (Kauchak & Eggen, 1998). Students must also receive challenging tasks, encouragement to stay on task when

grappling with open-ended questions, and ongoing feedback about their progress (Crowl et al., 1997).

Team or group work facilitates knowledge construction through social interaction. Team and group work profit from careful strategic planning, including development of tasks, group procedures, materials, and assessment methods (Kauchak & Eggen, 1998). Student performance improves with monitoring of student activities and minimized transitional periods from one activity to another (Brophy; Crawford; both cited in Crowl et al., 1997).

The forms of group work found to be effective for the development of thinking skills include student discussions, peer tutoring, and cooperative learning. In any of these situations, using introductory activities to develop rapport or "warm up" for the team or group can facilitate group interaction (Kauchak & Eggen, 1998). At the start of a group, use some team-building activities and time for students to do get to know group members. Collegehints.com (n.d.) provides an at-a-glance summary of variations on several group methods.

Discussion Design Elements

Student discussions "stimulate thinking, challenge attitudes and beliefs, and develop interpersonal skills" (Kauchak & Eggen, 1998, p. 250). When organized and managed well, discussions allow students "to develop critical thinking abilities and investigate questions that don't have simple answers" (Kauchak & Eggen, 1998, p. 250). For best results, it is useful to assure the presence of student background knowledge before using discussions. Options that work include *peer tutoring* , *cooperative learning* (with more students), and *group investigation* in which students in study groups investigate a common topic.

Constructive Controversy Design Elements

Constructive controversy combines critical and intellectual thought processes with cooperative learning. It is competitive and cooperative, engaging students in higher level thinking and rehearsal of cognitive skills (Manhattan College, 2002; Johnson, 1997; Johnson et al, 2000). Stanley (2002) provides an excellent review of the need to structure and manage conflict and controversy. Maughan (n.d.) describes the levels of interdependent and independent features required in effective use of small groups, group dynamics to consider, and tips for managing groups.

Instructional and Content Decisions

Verification 1: What was the teaching model?

The web course designer reviewed the course content in the current textbook and prospective new textbooks, activities, and tests; scanned the news and Internet resource materials about the topic of media law and ways to analyze media law; attended interprogram Communication and Information Studies meetings at which needs of students from both programs were discussed; and reviewed notes about the debates and analytical critiques that were prompted by the faculty in the class dialogues. The web course designer shared the following conclusions about the nature of the course content and teaching strategy and sought confirmation from the faculty before proceeding further with the course design.

- Decisions about lawful use of media involve social, political, and legal issues.
- People making decisions about lawful use of media have different perspectives.
- Values and processes operating in using media and making decisions about media often are in conflict.

- Standards and decisions evolve over time, often involving case law to clarify facts and values around which the conflicts develop.
- Students dealing with media legalities will have a greater capacity for identifying and articulating issues if they have a framework for analysis, they develop the competence to engage in critical inquiry and social dialogue about the issues, they have the ability to see the opposing arguments surrounding an issue or position, they can articulate facts about the controversies in media law, and they can articulate well-reasoned arguments supported by evidence.

The web course designer suggested the *jurisprudential inquiry model* (Joyce, Weil & Showers, 1992, pp. 73-91) as the best fit with the faculty's teaching process and nature of content, and reviewed implications this model had for the online activities. The next challenge would be to structure course assignments for reasonable progression through a 15-16 week course, using an unfamiliar online interface and teaching processes that would maintain a vigorous intellectual climate, engage students in thoroughly exploring important issues, probe and develop levels of thinking, and support students in taking, testing, and refining their positions and arguments.

Verification 2: What resources would support students in learning prerequisites needed for critical and analytical thinking about the rapidly changing field of media legalities?

The web course designer searched for resources that could support the students in learning prerequisite skills as well as main content. Among prerequisites was familiarity with agencies making decisions and influencing media law and policy. The web course designer identified fifty-one such agencies. Students, given this list, were able to divide-and-conquer, each doing research and describing a few in a structured online area producing a complete description for the whole class.

Possible issues and briefs were lengthy. A few examples follow.

Internet Access in Public Schools http://nces.ed.gov/pubs98/98031.html
Telemedicine http://www.legis.state.wi.us/lc/TELE/ncslbrief.htm
Encryption http://www.usta.org/encrypt.html

The lead faculty solicited *hot topics* from the students. From this list and the research list, the faculty generated the final issues and assignments to teams. Each student received a team assignment after the second week of class. Team membership remained the same throughout the course. There were twelve teams of 3-5 members each, each assigned to one major topic.

MMC 4210 – Spring 2002
Constructive Controversy Topic Assignments

1. Do the electronic surveillance provisions of recent anti-terrorism legislation, such as the USA PATRIOT Act, constitute a serious threat to the personal privacy of law-abiding members of the public?
Team 1. Pro
Team 2. Con

Constructive controversy was chosen as the focus of students because it more favorable expressed the disposition of using critical thinking and analysis in controversies to promote effective decisions and changes rather than the term *debate* that focuses more on argument and winning or losing. Having decided on constructive controversy, it became equally important to identify sources that might provide a frame of reference for the analysis process, a supporting

structure for the student's activities. The web course designer identified web accessible possibilities on *how to brief a case* and *how to do a policy analysis*. Students were given the links and a text explanation of how to proceed with analysis along with each activity and assignment.

The web course designer documented possible *discussion questions* from the resource review process, including ideas from prospective textbooks. A couple of examples follow.

What are the "punishments or consequences" for violation of "rules" v. "ethics"?
How "speedy" are the punishments and consequences for violation of "rules" v. "ethics"?

The lead instructor and web course designer grouped the resources, adding more whenever the lead faculty identified gaps, so that students received a variety of search tools, libraries, and other resources to locate information on the topics for the course.

- Library and Internet Resources
- Electronic Law Libraries and Resources
- Introduction to the Media Law and Policy System
- Specialized Copyright Issues
- Specialized Cable and Telecommunications Information

One of the challenges was how to deal with anticipated lack of familiarity by some students with the U.S. government and processes by which laws are established. The lead instructor and web course designer had difficulty judging the amount of structure that would be needed for these adult students, but documented the resources, making web-accessible links available. The faculty and web course designer identified the following levels of interrelationships for student expectations.

Goal Develop critical analysis and insight into the process, perspectives, interrelationships, and influence of technological, political, and sociological changes on policy, decisions, and laws governing the use of media.

Constructive Controversy Skills	Articulate position, evidence, and argument	Approach controversy to bring everyone closer to making change, not to make a good argument	How to work as a responsible individual on a team and as part of the whole team
Analytical Skills	How to articulate argument and evidence	How to do case analysis	How to do policy analysis
Discussion Skills	Location of discussion areas	How and when to input postings and replies	How to follow protocols of courtesy and clarity
Entry Level Content and Procedural Skills		Entry Level Content (U.S. Government; How laws are made)	Entry Level Procedural Skills (How to use course interface; how to use Internet; how to search for evidence)

Planning sessions included development of a course map for each week, the first of which follows, showing the topic, objective, and activities planned for the first week.

Course Name: Media Legalities ***Course Number:*** 4210
Lead Faculty: Pat Hadley ***Instructional Designer/Online Course Developer:*** Ludy Goodson
Course Goal: Develop critical analysis and insight into the process, perspectives, interrelationships, and influence of technological, political, and sociological changes on policy, decisions, and laws governing the use of media.

Topic: Course Structure and Process ***Week # 1 Objectives***	***Activities*** *(What do you want students to do?—to read, discuss, write…feedback to receive or give…for each objective.)*
Objective 1. Identify course requirements and topics of importance in contemporary media law. 1-a. Identify resources to support use of course website, course goal, assistants and instructor information, course objectives and content, and major ongoing discussion areas. 1-b. Identify online communication guidelines. Note: "1-a" and "1-b" are just two of the enabling objectives related to "Objective 1." Others followed in the remainder of the course map.	Activity 1-1, Course Overview 30 min (1) Review http://www.lis.fsu.edu/Resources.cfm Student Help Pages. (2) Send email to assistant/mentor confirming enrollment (3) Review Syllabus and Introduction to Media Legalities video and then post comments and questions; review classmates postings and reply to at least one; respond to any replies you receive Activity 1-2, Communication Guidelines 30 min (1) Review communication protocols, including "Core Netiquette Rules" at http://www.albion.com/netiquette, "Simple Rules of Netiquette" at http://education.indiana.edu/~icy/netiquette.html, "Chat Etiquette" at http://illinois.online.uillinois.edu/jennlieb/TOHE/chat_tohe.html (2) Post answers to questions about "time" and "privacy" as two separate entries; review classmates postings and reply to at least one; respond to any replies you receive Activity 1-3, Personal Profile 30 min (1) Prepare personal profile, including answers to five questions; post your own profile and review those of others. (2) Post comments or questions to at least one classmate; respond to any you receive.

This approach to documentation allows a course to be structured more easily for explicit communication of activities. Such communication becomes critical when a third party will do the actual uploading of content and naming of discussion areas.

After weeks of planning sessions, and after working many of the course content details, such as textbook selection, the lead faculty compared the old to the new course when making the formal request to allow Media Legalities to become an online course:

The student learning environment in the new syllabus actively integrates the benefits made available in the web-based context. Students will engage in a range of asynchronous reflective discussion and synchronous chat activities and assignments, all with advance preparation and study. Students will engage in group discussions, peer review, consensus teamwork, and constructive controversy. They will generate questions to ask of the instructor and to ask of each other, and they will generate answers in response to questions. They will review and reflect upon key issues and concepts and will engage in critical analysis, debate, and critique. In many ways, the web-based syllabus provides an enhancement over the learning opportunities available in the face-to-face classroom.

Doggedly working out the detail of the content, concepts, and activities allowed the structure of the course to evolve, while simultaneously accomplishing the following milestones:

(1) grouping content, concepts, and activities into weekly schedules and point systems

(2) identifying major themes that could function as *scaffolding* to support the issues, briefs, and information (to present in video and text overviews of grouped weeks); and

(3) creating a structure for preparing students to accomplish research, analysis, argument, and challenges to and support of such argument on issues of importance and interest to them

Students received support in the form of organization and different levels of directions provided in the syllabus, planned email messages and announcements, directions posted with

activities in the online discussion areas, planned feedback and guidance from mentors, and personal messages in the video presentations from the lead faculty.

Students received a preview of all course elements in the syllabus. The syllabus provided a preview of the types of course assignments and activities, including:

- readings
- study and research
- case briefs
- policy analysis
- reflections
- discussions
- chats
- partner review exchanges
- constructive controversy team debates
- feedback and guidance

The syllabus expressed the importance of working as a community of learners, giving guidance and feedback to each other, and gave a summary of the partner and team assignments to be accomplished in the course. The syllabus advised students that they would receive team assignments and topics of controversy to investigate after the second week of the course.

The course design progressed from simpler group processes to more complex ones, and from simpler content to more complex content. Case brief assignments came before policy analysis, personal issue analysis came before media issue analysis, simple discussion postings came before partner exchanges and postings, partner exchanges and postings came before team discussions, and individual research assignments came before group assignments.

Each video production was 2-5 minutes, digitized for access in broadband, low bandwidth, audio only, and text, and provided at 3-4 week intervals to communicate major themes for the upcoming studies.

- Video Script 1. Introduction to Media Legalities
- Video Script 2. Sources and Perspectives of Media Law
- Video Script 3. Evolution of Media Law
- Video Script 4. Stages of Constructive Controversy

Each week of the online course engaged students in readings, discussion activities, and assignments. Students also completed occasional quizzes. Major milestones supporting the constructive controversy assignments included:

- Week 1, become familiar with communication protocols
- Weeks 2-3, become familiar with research, laws, and hot topics
- Week 3, receive complete constructive controversy assignment
- Weeks 4-5, complete first brief, partner exchange, topic and team assignments, and initial communication with team members
- Week 7, complete policy analysis and exchange with partner and reach team consensus on one assigned issue
- Week 8, submit abstracts and reference citations on individual research to support constructive controversy team assignment
- Week 9, complete advocacy brief and partner exchange
- Week 11, post team's consensus on position statement
- Week 12, review position statements posted by other teams

- Week 13, review constructive controversy debate protocols, confirm times for debates, submit to instructor draft of team notes on anticipated arguments and possible response
- Weeks 14-15, complete constructive controversy debates; review transcripts and post challenges on any two debates, posing questions or counterarguments to clarify issues; respond to challenges that your team receives; submit individual argument for the reverse position on your team's controversy topic

Students received the constructive controversy assignment in the third week, guiding them through phases of the total project. They received other supports to keep them on track such as the email message assigning their topic and team, an announcement posting the same information at the course site, and reminders about what to do, when, and where as phases of the constructive controversy assignment were due. A part of the evaluation for this assignment included peer peer evaluation of team members, giving students the opportunity to rate the contributions of their team members, including self-evaluation.

Constructive Controversy Team Assignment

Purpose

You will be one of three to five (3-5) students in an assigned Constructive Controversy Team. Individually and as a group, you are assigned a topic or issue of controversy. Your purpose is to prepare for online debates with your classmates. All of these controversy topics will be related to issues you have been preparing for the whole term, so you should be able to articulate positions and counter-positions using sound reasoning, logic, and evidence.

You are a member of only one team. Each team has a number, e.g., Team 1, Team 2, etc. Make sure that you know your team number, your team's assigned topic, position, and names of teammates. Make sure that you know your opposing team's number, topic, position, and team names. If you are unsure of any part of this assignment, send an email to your instructor seeking clarification.

Grading

Grading for All Phases of Debates 40 points

Quality of responses will be reviewed for assignment of points for the debates as accomplished during this week and the following week. As a reminder, these are the standards for the points:

- clearly stated position
- argument or response, using sound reasoning
- supporting evidence from readings or resources
- explanation of analysis of issues in a way that makes it clear how you decide or stand on the case
- courteous and professional communication style
- compliance with instructions for how to proceed in the debates

You have individual and team responsibilities and the quality of your work as an individual and as a team member will influence your grade. Each member of each team will be provided with a team evaluation form to complete on the level of participation of each member of the team. Evidence of lack of team participation can have a negative effect on your grade. Evidence of strong participation can have a positive effect.

Team Process

During your research and discussion, you will have your own private discussion area for your teamwork. Over the coming weeks, you must develop a team strategy for your constructive controversy debates. To do this, plan to keep notes on your communications. You may limit your communication to your team's discussion area. You may use other communication methods, such as email exchanges and phone calls. Remember to keep your notes organized because they can help you in your preparation for your debates.

You may work on this assignment throughout the term, but your debate will take place in stages across several weeks. All of the debates will take place in assigned discussion areas for individual topics of controversy. Starter threads will indicate where to post “PRO” and “CON” consensus statements and every other phase of the debate process. You will be given specific instructions about what to do in each phase of the debate process for each of the forthcoming weeks.

Individual Responsibilities

You, and every other member in your group, must submit research on the assigned topic of controversy and discuss your debate strategy. Minimum requirements are set forth here. However, you are expected to work as a team member as well as an individual, and to exceed the minimum requirements. You are expected to complete your own research for your part of your own team’s topic. You must post this research in your own team’s discussion area. (You will be reminded of when to do this in the forthcoming weeks.)

The minimum individual research requirements include the following:

1) find and read three articles or valid web resources related to the issues or topic of controversy
2) for each resource you find, give a complete citation and an abstract (a minimum of three)
   a) post the complete citation right above the abstract
   b) limit the abstract to 1-2 paragraphs for each of the two resources
3) check the accuracy of your citation with each group member—your group members must agree that each citation is complete and must be able to easily find the resources you have cited
4) post your citations and abstracts by the eighth (8th) week of the course

You are expected to prepare your own separate content and writing as your own individual statement for your assigned topic and position on the topic. You will post this later in the course when the debates begin. Each of you must post 100 words or less of separate content and writing…as your own individual statement.

Team Roles

By the eleventh (11th) week, in your team discussion area, your team must have reached and posted a consensus on your position statement. You will find it useful to cover the elements in the policy analysis checklist given earlier, but make sure that you develop more fully your reasoning, data, and evidence. Your position statement must be clearly stated. (You and your team members will be reminded of when to post this consensus.)

In preparing for your debates, you and your team may choose to divide the work into different sections, so that each of you focuses on particular issues so that you become a team of ‘experts.’ Or you may choose a different approach in order to fully cover the issues. You and your team members should agree about who will do what roles in the discussion process. If you have only three members, you must double up on some of the roles. In your discussion, each of you may have one of five roles as follows to facilitate and focus your discussion: “The Organizer,” “The Responder,” “The Encourager,” “The Summarizer,” and “The Recorder/Poster.” Other teams have found this “division of labor” useful.

Please remain flexible in your approach to these roles. To work well as a team, it is important to avoid “role overload” and that is why these roles are suggested. The roles reflect team tasks to accomplish, and you may think of another role that also would be helpful. Or you might divide the discussion at another level, too. For example, you might choose to have each team member focus on particular issues as well as fulfill certain roles in the discussion. But you must make these decisions BEFORE further discussions in order to fully prepare and get the most out of your time.

“The Organizer” If this is your role, you will post the first message to your own team’s discussion board. In your message, do the following:

1) give the name of the controversy topic
2) state your understanding of the controversy topic
3) solicit opinions from other members

“The Responder” If this is your role, you will post a reply to the first message posted by “the Organizer” to the discussion board. In your reply, do the following:

4) answer a question or ask a question
5) add to the information already given

"The Encourager" If this is your role, you will encourage the discussion by doing the following:

6) address and encourage each member of the group to post a contribution to the discussion (may omit if the members initiate their own postings without encouragement)
7) add to the information already given

"The Summarizer" If this is your role, you will have two responsibilities in tracking and summarizing by doing the following:

8) keep the discussion on track by redirecting the focus of individual members if needed
9) after every member has posted at least once, summarize the content or main issues of the messages
10) summarize again after new postings

"The Recorder/Poster" If this is your role, you will have two responsibilities in recording and posting by doing the following:

11) record your own notes on the progress of the discussion as it moves along and compare your notes to those provided by "The Summarizer"
12) bring any differences in your notes and the "summarized notes" to the attention of the entire team
13) prepare the team's statement by using the summarized notes and collecting contributions from each team member
14) submit the statement to all team members for review and revision before posting
15) post the final consensus statement as "Team #, NAME OF TOPIC" at the Constructive Controversy discussion area.

Debate Preparation

In the eleventh (11^{th}) week:
Locate your debate area by looking for the Discussion Board with the title "Topic _ Debate, Team _ v. _". For example, "Topic 1 Debate, Team 1 v. Team 2, and make sure you find the correct area for your team.

Post your team's final consensus statement as "Team #, NAME OF TOPIC" at the Constructive Controversy discussion area. Your team's position statement must be honed down to no more than five (5) double-spaced pages, but it must be well supported with logic and evidence.

- If your team is PRO, post your consensus statement under the "PRO Consensus" thread. If your team is "CON", post your consensus statement under the "CON Consensus" thread.
- Review your own team's consensus statement. Decide if it is complete and accurate. Make sure that you understand it and you have information to support your team's position.

In addition, post your own separate content and writing of your own individual statement for your assigned topic and position on the topic. Post it in your assigned debate area under the thread for your position.

- If you are PRO, post your PRO statement on the topic under the "PRO Initial Statements" starter message.
- If you are CON, post your CON position statement under the "CON Initial Statements" starter thread.

Read all the initial statements for your own team and for your opposing team. This means, read all "PRO Initial Statements" and all "CON Initial Statements" for your topic. Then prepare a reply as follows.

- If you are a PRO team member, post a single reply to address all the "CON Initial Statements".
- If you are a CON team member, post a single reply to address all the "PRO Initial Statements".
- Within your reply, make sure that you name the issue and person to whom you are replying, and limit your reply to three (3) sentences. (If you are replying on one issue to 5 individuals, this means that you can have up to 15 total sentences). Make sure that you "interpret" the "argument" of the opposing team (individual) and reply directly to the argument.

In the twelfth week (12th):

Read each of the other teams' consensus statement at the each assigned Discussion Board for the controversy topic. Then submit one question or counter-argument as a "Counter Reply" to each PRO and each CON consensus statement. The purpose is to get to the point and to provoke some thinking about the issues. Just use your head to think through the issues. Do not do any additional research for this counter-reply.

In the fourteenth week (14):

Note: You may choose an earlier week to proceed with the debates if all team members of your team and your opposing team on the topic agree and you obtain the approval of your mentor or instructor. Remember: The transcript of your debates will be available to the whole class. Every class member may make comments, ask questions, and discuss the issues on the Discussion Board for each controversy topic.

- "Open Debates": Proceed to openly debate the topic with your opposing team under the "Open Debate" starter thread for your debate area. Use evidence and logic. You are free to react to any statement made by the other team or by your own team. Just keep in mind, you should be showing *support* for your team's position.
- "Final Statements": Post your own final individual statement. Your individual statements must be no more than five (5) sentences. If you are a PRO team member, post it under the "PRO Final Individual" starter thread. If you are a CON team member, post it under the "CON Final Individual" starter thread.
- "Stand for Two": Choose two topics on which to take a stand for debates in which you did not participate. "Two topics" means two separate debate topics. (It does not mean two opposing positions on the same topic.) For each of your two topics, describe your own position, cite your reasons and your evidence. Use no more than a page (about 250 words) for each topic.

✓ If you are taking a PRO position on a topic, submit your statement under the "More PRO" starter message of the debate area for the topic.

✓ If you are taking a CON position on a topic, submit your statement under the "More CON" starter message of the debate area for the topic.

In the fifteenth week (15th):

- "Rebuttals":

✓ If you are on a PRO Team, look over the "More CON" postings for your topic.

✓ If you are on a CON team, look over the "More PRO" postings for your topic.

✓ Consider these postings as challenges to your position and reply accordingly. This is your own individual responsibility, not a team reply. Reply to the postings to give a rebuttal to the challenges and to reaffirm your position in 3-7 sentences.

Prepare at least one comment concerning the "Constructive Controversy Team Assignment" and ask a question about anything that you do not yet understand. Post your comment(s) and question(s) as "CCT Comments and Questions" at the Constructive Controversy discussion area.

Monitoring of Debate Progress

The mentors for your team will check your debate progress, but will not give you tips on how to debate. They will give you guidance only as needed such as reminding you of what to post, clarifying questions about where to post, and when to post.

Mentors cannot do any work for the team, cannot participate in the creation of any work product, and their roles are not intended to take large amounts of time for dialogue.

Variations It may be possible to conduct short constructive controversy debates in chat sessions.

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Formative Evaluation in Online Courses

Ludy (Ludwika) Goodson
Web Course Designer
Office of Distributed and Distance Learning
Florida State University

Acknowledgement The author extends appreciation to the instructors of the courses for Media Legalities, Dr. Pat Hadley and Mr. Will Kinnally, and for the School of Social Work courses, Dr. Veronika Ospina-Kammerer with whom the author has developed several fully online, hybrid, and online support courses.

Abstract — What happens with formative evaluation in the online learning environment? Do organizational structures, reporting needs, and marketing plans take priority? With the focus on technology, do we gather the same kind of information found so valuable in one-on-one reviews in previous decades? As web course designers, have we forgotten, or did we ever know, the value of similar one-on-one's in online learning? Once we gather in-class information, what are some good strategies for analyzing the responses? How should instructors respond to students following such evaluations? After reviewing, approaches to formative evaluation in online courses, this paper will illustrate several approaches to eliciting feedback, the constructs/topics examined, and ways to analyze and respond to feedback from students. One approach will be outside of the Blackboard anonymous reporting survey system and a couple will be within it. The presentation will include a description of the types of responses by instructors to students following their responses to formative evaluation surveys.

Through the looking glass — Evaluation is the process of determining the merit or worth of a product, process, or program (Scriven, 1991). The lens for viewing success shapes the vision. Andrews and Goodson (1980) identified 38 models that recommended evaluation of materials before their implementation. Harvey, Higgison & Gunn (2000) reviewed abundant resources that provide guidelines for conducting and reporting evaluations. Richey, Fields, Foxon *, et al.*. (2001) include evaluation of different types in the standards for instructional design competencies.

Lynch (2004) proposed that the evaluation mission shape the dimensions of the evaluation. For example: What decisions do you want to make? Do you want program improvement? Do you want justification or accountability? Do you want an inside or outside evaluator? Do you want to use a quantitative or qualitative strategy? Different approaches serve different purposes (Hughes & Atwell, 2003; Eseryel, 2002; Oshaug, n.d., Rockwell, 1999; Strother, 2002), some of which include:

- **timing** (needs assessment, context evaluation, and pre-production, Baggaley, 1986, Flagg, 1990, Zulkardi, n.d., summative v. formative, Scriven, 1991; Dick & Carey, 1996; Peat, 2000; Stakes cited in Saskatchewan Publications, 1991 and NASA, 1998)
- **focus or purpose** (needs assessment v. effectiveness of objectives v. impact on transfer of knowledge and skills v. maintenance to keep systems working, Reeves, 2003; illuminative, integrative, curriculum analysis, assessment analysis, course influence on learning, Peat, 2000; heuristic evaluation and usability of a system (Anand, 2000;

Georgiadou & Economides, 2003, Lee, 1999); return on investment, benchmarking, product and performance evaluation (Hughes & Atwell, 2003); formative to make improvements v. summative to make judgements, Weimer, 1978 cited in National Education Association, 1995; formative, summative, confirmative, Richey, Fields, Foxon *, et al.*, 2001.)

- **approach** (holistic v. analytic, Scriven, 1999, and objectives v. management oriented, Scriven 1997)
- **combinations of time, product, and participants** (rapid prototyping, Driscoll, 1998; Smith & Ragan, 1999, Wilson, Jonassen & Cole, 1993; field-test, Dick & Carey, 1996, Seels & Glasgow, 1990, Tessmer, 1993, Smith & Ragan, 1999, production and implementation, Flagg, 1990, Zulkardi, n.d..); Alpha and Beta (Driscoll, 1998; Smith & Ragan, 1999)
- **reviewers** (expert, individual, small group, Dick & Carey, 1985; Bell & Abedor, 1977, cited in Weston, 1986; expert review (Seels & Glasgow, 1990; Tessmer, 1993; Smith & Ragan, 1999); however, expert review may correlate negatively with student achievement, Rothkopf, 1963; novice and experienced teachers differ in their thinking about how to improve their practice, Floden & Feiman, 1981 cited in Floden & Klinzing, n.d.)
- **method** (pre-addressed and stamped postcards to mail in at scheduled intervals, Flagg, 1990 cited in Willis, 1993; open-ended questioning, participant observation, non-participant observation, content analysis, interviews, and unobtrusive measures, Guba, 1978 cited in Willis, 1993; computer entries for evaluation, Sefton, 2000; observations, focus groups, interviews, National Science Foundation, 2002; anecdotal records, rating scales, interviews, tests, NASA, 1998; observation, interview, verbal report, think-aloud, video analysis, auto-data logging, software support, Lee, 1999)

Course designers and instructors in online learning need the kind of information gathered in the discrepancy model, comparing actual and desired outcomes of student experiences (Rockwell, 1999). Administrators need information from marketing and decision making models in which measurements reflect the decision-maker's values and interests; generally these must follow the philosophy, economic, and political restrictions of the university (Verduin and Clark, 1991 cited in Rockwell, 1999) and provide accountability by focusing on technology value and workability, consumer satisfaction, and student persistence, enrollment, retention rates, grades (Harvey, Higgison & Gunn, 2000; Hawkes, n.d.; Mabry, n.d.; Oliver, 2000). These different models for evaluation explain why departmental course evaluation forms are unlikely to serve the needs for an individual online course (Harvey, Higgison & Gunn, 2000).

When moving to online learning, faculty confront a preparation workload, cognitive load, and anxiousness about teaching online. Concerns are valid. Skills for online teaching require new approaches to visual and practical experiences and take time to develop (Donnelly & O'Brien, 2003; Fell, Bradbury, Vollmerhaus & Peacock, 2003). Time (rushing to meet deadlines, lack of money or budgeting), human nature (resisting criticism), unrealistic expectations (wanting to change a poor program to an instant winner, measurement difficulties (unknown methods for measuring), and knowledge (lack of expertise in formative evaluation procedures) (Flagg, 1990, cited in Reeves, 2003) may limit attention to formative evaluation and the top priority may be *getting the course up.*

Improving courses — Formative evaluation improves courses; revised materials produce better student learning (Branson, 1982; Eisenhamer, Kniseley & Daou, 2004; Harvey, Higgison & Gunn, 2000). Processes of formative evaluation could mean obtaining information

at periodic times during design and implementation, continuously collecting and using data as activities are carried out, making adjustments based on immediate feedback, and using multiple sources of data including students (Callison & Haycock, 1988; Dudley-Marling & Owston, 1987; Harvey, Higgison & Gunn, 2000; Hoepfl, 1997; Johnston, 1987; Kosmoski, 1984; Oshaug, n.d., Richey, Fields, Foxon *, et al.*, 2001; Reiser & Dick, 1990 cited in Stirling n.d.; Schueckler & Shuell, 1989).

Computers offer rapid access to evaluation tools and immediate results (Marsh, McFadden & Price, 2003) and practitioners need practical resources and tools Oliver (2000). The standards for evaluation expressed by Richey, Fields, Foxon *, et al.* (2001) are not integrated into roles defined for teaching. If included, it is through influence, not mandate.

Questionnaires, surveys, reflective logs, case study research, checklists, analysis of discussion postings, external evaluator review, focus groups, analysis of student products, assessment data, and comparative studies are among possible approaches for collection of formative evaluation data (Harvey, Higgison & Gunn, 2000; Richey, Fields, Foxon, *, et al.*, 2001).

Before developing their checklists for evaluating hypermedia and comparing stand-alone to web-based courses, Georgiadou and Economides (2003) showed the complexity of issues surrounding evaluation of content, presentation and organization, technical support, and learning.

After considering these issues, Georgiadou & Economides prepared checklists to collect comparative quantitative data. Considering the same factors, however, can lead to different decitions. What is the fulcrum balance point for time management and systematic rigor of evaluations? How much weight will be given to each? What data should be qualitative v. quantitative? The answers are idiosyncratic to the context. Instructors are responsible.

For all courses in this report, the interest would be the match-up between intended and observed outcomes using responsive qualitative evaluation. This choice would sacrifice precision in measurement, but provide useful findings (Stake, 1975), in this case, the *user's reaction* (Pothas and Wet, 2000; Stake, 1975) and would support the artifacts of learning and interactions more readily observable in the web course environments.

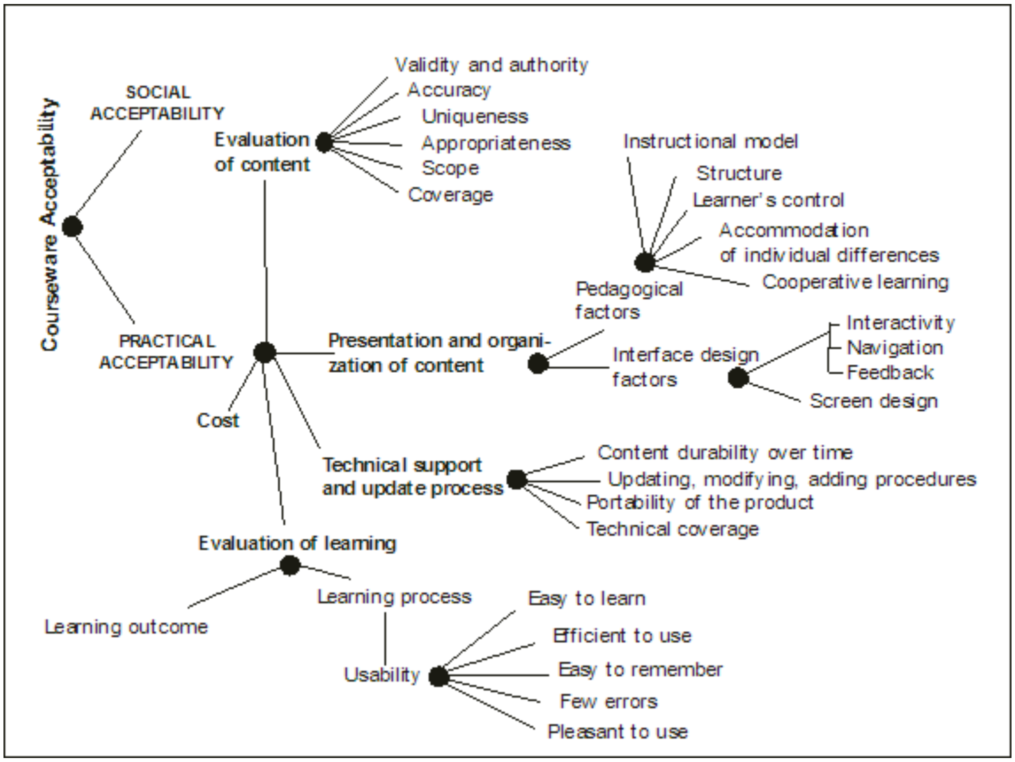

Figure 1. Diagram of the evaluation framework, Georgiadou & Economides, 2003. *Permission to use, May 4, 2004.*

Protocols — Reeves (2003) advises timely and specific reporting on formative evaluation data and keeping a detailed log. In reporting results, written comments often are listed, sometimes in broad categories, rarely in a form that analyzes and identifies issues (Gray, 1999; Hodd, 2003; Waddoups & Howell, 2002). Willis (1993) suggests using the instructor's own reflection and making revisions as soon as possible after the course ends. But revisions may be needed *before* a course ends. The timeliness and method of providing and using formative evaluation data needs to coincide with the need for making good use of the data (Oliver, 2000).

The course on Media Legalities had new objectives, text, and content delivered for the first time online, with layers of constructive controversy as a progressive and final project. The lead faculty for development and delivery left the university and another instructor delivered the same course in succeeding semesters. Courses for the School of Social Work included papers and tests as major assessment tools. For all of these courses, formative evaluation proceeded in three major phases, as shown in Table 1: Early Design, Site Development, and Implementation.

	Early Design Phase	**Site Development Phase**	**Implementation Phase**
Course Materials	Course Map Course Content Course Activities	Prototype Materials and Files in Online Course Areas	Near Final at Implementation of Course
Purpose	Plan and Align ▪ Syllabus ▪ Schedule ▪ Content ▪ Objectives ▪ Activities ▪ Assessments	Verify Accuracy and Alignment ▪ All Course Areas ▪ Dates ▪ Submission ▪ Instructions and Operations	Determine Changes Needed ▪ Online Office ▪ E-mail ▪ Discussions ▪ Surveys ▪ Tests

	▪ Course Areas welcome syllabus assignments weeks discussion boards projects/papers quizzes/exams library/resources	Check Links Review Mentor Role if Assigned	
Evaluators	Web Course Designer Lead Faculty	Web Course Designer Instructor	Students Instructor Mentors Web Course Designer

Table 1. Stages of formative evaluation for media legalities and social work web courses.

Early Design

The *early design* phase involved meetings of the web course designer and lead faculty. The course maps and course platform areas served as guides for organization. The faculty planned content, provided the teaching approach, determined assessment and grading protocols. The web course designer provided alternative design options and analyzed methods for web technology applications. No students were involved in this early design phase. No mentors were involved in this phase.

The focus of course materials was on a course map of the objectives, activities, and assessments; the course content such as textbooks, web resources, online library files and links, video files, and instructor notes; and the types of course activities to support learning and assessment.

The web course designer and lead faculty followed the provost's guidelines for syllabus requirements; the lead faculty developed the syllabus. Both collaborated on organizing content, objectives, activities, and assessments in the schedule of weeks for the course.

Site Development

The *site development* phase involved continued meetings, development and uploading of content, video scripts, producing and digitizing videos, collecting images and text for lecture files, developing the welcome announcement, developing weekly folders and items with directions and submission guidelines, review and design of tests and projects. No students were involved in evaluating the site development phase. No mentors were involved in this phase.

The web course designer and lead faculty reviewed alignment of materials with each other and accuracy of content, instructions, and schedules. The lead faculty revised the syllabus for compliance with requirements, alignment, and clarity. Both collaborated on checking and revising for alignment of content, objectives, activities, assessments, schedule of weeks, workability of links, and course site operations. Both planned the mentor guidelines.

Implementation

The *implementation phase* involved weekly checking of links, communication about concerns and technical difficulties, refinement of tests (social work) and team assignments in constructive controversy (media legalities). Students provided input in different ways. The web

course designer and lead faculty discussed Online Office, e-mail, and discussion postings and feedback appropriate for the concerns, e.g., resources for technical support, library support, or other issues for which students might require redirection. Mentors gave feedback to the instructor through their questions about their roles. Both the instructor and web course designer met weekly and communicated daily during each term for progress compared to expectations.

Collecting information — Instructors used other sources of information identified in Table 1, e.g. online office postings, e-mail concerns, discussions, performance, and assessment data as indicators of success or problems with course components. The greater effort in systematic appraisal involved responses to the online surveys. These would be anonymous and students could feel free to express viewpoints.

Some approaches encourage response rates to surveys. Moss and Hendry (2002) found these approaches successful: use surveys infrequently, keep them short, design them simply, make them easy to access and use, notify students of availability, support computer operations as needed, give enough time to complete the survey, motivate the students, assure anonymity, display results to students, evaluated during not just end of course, involve students in framing questions, post the prior year's results, give feedback to show students their input is powerful.

In the media legalities and social work courses, the instructors gave no explicit rewards, but encouraged students to complete the surveys, did not involve students in framing the questions, and did not post prior results. The surveys had 2-3 open-ended questions asked at the close of three and eight weeks in courses with fifteen-sixteen weeks in the term. Response rates were high with both approaches, but higher using the Blackboard survey tool (about 80% compared to nearly 100%).

In the first delivery of the course, students in media legalities received an invitation:

The Florida State University's Office of Distributed and Distance Learning is interested in creating excellent distance learning courses. We take your evaluation of courses very seriously and your responses will help us to improve the course design and instruction.

We are seeking a quick-check on the "web pulse" for this course, and hope that you will answer only as much as you wish in reply to two questions. We welcome whatever information you care to share about your experience with MMC 4210 during your first three weeks in the course.

We would very much appreciate your response to this e-mail query about your experiences. The requested reply date is _____. You also are free to skip this activity without penalty. This is not a graded activity.

Your identity will not be reported to the faculty or the mentors. Only the web-course designer will see your actual reply. The report of your replies will contain all of the replies without individual names or any other identifying information.

Question 1: Self-Evaluation of Learning
After the first three weeks in this course, what observations, if any, do you have about what you are learning?

Question 2: Concerns and Satisfactions
After the first three weeks in this course, what concerns or satisfactions, if any, do you wish to express about any part of the course design, activities, or process?

In the second course delivery, this note was added:
DO NOT CLICK ON REPLY TO THIS MESSAGE. USE THE FOLLOWING ADDRESS:
lgoodson@oddl.fsu.edu

Students in the social work courses would see a link to a survey and received ad hoc notifications and reminders in announcements and emails:

EMAIL
Subject: Weeks 1-3 Evaluation for SOW5656

Reminder: If you have not already done so, please remember this weekend to complete the course evaluation survey as well as the other assignments due (reading, journal article, topic & outline, two discussions).

At our course website, you can access the survey from the Announcement page or at the Assignments area at the end of the page in "Surveys." The anonymous information you provide will help us improve this online course. Thank you for taking the time to do this task.

SURVEY

The Florida State University's School of Social Work is interested in creating excellence in its courses and your evaluation will help us to improve the course design and instruction. We welcome your ideas and encourage you to answer as briefly or as completely as you wish in response to the three questions below. Your identity will not be revealed because this is an anonymous survey, and you will have an opportunity to respond again at the 8th week and at the end of the course. Thank you for your cooperation and taking the time to answer these questions.

What do you like LEAST about this online course on Psychopathology in Clinical Practice?
What do you like MOST about this online course on Psychopathology in Clinical Practice?
What could make this online course on Psychopathology in Clinical Practice BETTER?

For the Media Legalities course, the web course designer collected survey responses by email and word processing operations since the course platform did not include a survey tool. For the social work courses, the Blackboard survey tool provided an automated list of responses to each question.

The web course designer provided support in analyzing and interpreting the survey responses for the purpose of establishing a method that the instructors would choose to use in the future without the support of the web course designer.

Analysis can proceed in several ways, as in qualitative research where combinations of deductive and inductive analysis produce insight. Formative online course evaluation stops short of iterative testing for building educational or medical models and is not formal enough to be classified as research, lacking a robust theory, having no experimental design, and having vague

or nonexistent specification of variables (Phillips *, et al.*, 2000). Nonetheless, analytical protocols for qualitative research still provide excellent strategies for classifying text responses with inductive and deductive methods to categorize data in formative evaluation (Bogden & Biklen, Lincoln & Guba, Patton, and Eisner cited in Hoepfl, 1997; Lacey & Luff, 2001; Pope, Ziebland, and Mays, 1999, 2000). Such analytical strategies tend to avoid the problems of software packages sometimes favored for coding narrative text since the software results in *fragmenting* and *decontextualizing* text responses (Pope, Ziebland, and Mays, 2000). For this reason, they also may not save time as intended.

The qualitative analytical process begins with annotating or marking up themes in notes or transcripts. Analysis can continue by using headings from the framework to create charts and searching for patterns, associations, and explanations in data as shown below. This process requires the ability to separate relevant from nonrelevant data, also known as theoretic insight (Strauss & Corbin cited in Hoepfl, 1997).

CASE EXAMPLE	Theme 1 Service rationale	Theme 2 Role of complementary therapies	Theme 3 Limits to integration
GP Number 1	Public wants them (2:25)	For conditions orthodox medicine fails (5:12)	Conceptual differences (7:15)

In another example, Meyen, Aust, and Yang (2000) show a similar process in a Beta audit to evaluate and revise 75 lessons in 22 online modules.

Staff M1	Perhaps because the modules are trying to reach both individuals with experience and novices, I found the introductory material to be more than needed. Some of the content was very basic.	Content too basic.

For the media legalities course, the analysis process was similar, adding key words with + and - coding. The process was meant to include *coherence* (themes that make sense from the data, *consensus* (concurrence with other data), and *instrumental utility* (usefulness to the instructor and course designer) (Eisner, cited in Hoepfl, 1997).

Key Words	**Self–Evaluation of Learning** After the first three weeks in this course, what observations, if any, do you have about what you are learning? *(n–date of response)*	**Key Words**	**Concerns and Satisfactions** After the first three weeks in this course, what concerns or satisfactions, if any, do you wish to express about any part of the course design, activities, or process? *(n–date of response)*
+ Important + Easy Navigation	I think that what I am learning is important to my major. The interface makes it easy to	– Hard to Find Materials	So far, the biggest concern that I have is that some of the activities are not organized in a fashion that

+ Assistance	navigate and I like the delivery of the class. So far the Instructor and my mentor seem to be able to assist me with any questions or concerns I may have. *(12–1/27)*	– Hard to Understand – Feedback	is easy to read or understand. I fear that I may overlook an important activity or miss a due date. So far everything else seems okay. I have not received any grades yet for any of my assignments to know whether or not I am understanding what is expected of me. *(12–1/27)*

From the individual short titles, it was possible to create the following chart, from which the summary was then written, grouped into the following categories (1) Interest Level and Learning; (2) Information, Content, Readings, and Resources; (3) Organization, Design, and Presentation; (4) Activities, Assignments, and Discussions, (5) Directions, Instructions, and Mentor; (6) Pace, Workload, and Due Dates. The instructor determined the issues that needed attention and made revisions. Formative evaluation continues to be an integral part of the instructor's course planning.

Interest Level, Learning	**Information, Content, Readings, Resources**	**Organization, Design, Presentation**	**Activities, Assignments, Discussions**	**Directions, Instructions, Mentors**	**Pace, Workload, Due Dates**
+ Q1 Interesting + Q1 Interesting +Q1 Interesting + Q1 Informative + Q1 Atmosphere, Flexibility + Q1 Enjoyable – Q1 Not Enjoyable	+ Q1 New – Q1 Nothing New + Q1 Important + Q1 Preparation for Future (a lot of reading) + Reading + Q1 Law – Q1 Law – Q1 Law Focus – Q2 Focus on Definitions and Terms + Definitions – Q2 Difficult – Q2 Course Getting Harder	+ Q2 Best of All! Coordinated, Clear + Q1 Layout + Q2 Organization of Assignments – Q2 Hard to Find Materials – Q2 Hard to Find Materials + Q2 Everything Available + Q1 Easy Navigation + Q2 Design	+ Viewing Classmates' Work + Questions – Q2 Changing Activities – Q2 Discussion Content; Fewer Definitions, More Open Questions – Q2 Case Briefs – Q2 Not Enough Explanation + Q2 Activities	+ Q1 Assistance + Q2 Instructions + Q2 Processes – Q2 Links – Q2 Hard to Understand – Q2 Hard to Understand – Q2 Feedback (not any) – Q2 Feedback (not any) – Q2 2003 Announcements + Q2 Instructor Communication	+ Q2 No Worries + Q2 No Concerns – Q2 Textbook Delay – Q1 Worried about Keeping Up – Q1 Worried about Keeping Up – Q2 Work

In the social work courses, Blackboard created a listing of comments, the web course designer copied comments into a chart and reported results in two ways.

Key Words	**Least** What do you like LEAST about this online course on Psychopathology in Clinical Practice? *(n)*	**Key Words**	**Most** What do you like MOST about this online course on Psychopathology in Clinical Practice? *(n)*
– Computer proficiency	Shifting of paradigms is not easy. I have not ever taken an online course and the format is a bit harder than I originally thought. *(1)*	+ Journal article assignments + Sharing findings	I like the idea of the journal article assignments. I do not feel like I make enough time to keep up with current research and I learned that I have missed it. In addition, I like the sharing of findings from classmates. It's exciting to see what research other people have found. *(1)*

From all responses, tabular summaries were generated and the scanning of key words produced different themes: (1) Computer Technology; (2) Pace, Convenience; (3) Instructor, Mentor; (4) Classmates; (5) Directions, Instructions, Organization; (6) Content, Readings; (7) Discussions; (8) Workload; (9) Knowledge, Thinking, Learning.

Finding the time pressing, the web course designer offered a different summary protocol, as shown below for other courses. With both methods, the process of tabulating helped the instructor focus on issues rather than feelings about the issues. The second method was a product of coding responses and progressively creating the chart with analysis of each comment kept open in a separate window. The chart did not include students' comments, keeping the review short. The instructor preferred chart that retains text from which the summary is generated.

Topic 3: Course Content Liked LEAST	Liked MOST	Make BETTER
Links that did not work. Lack of specificity in directions. Hunting for items, e.g., survey at bottom of page. Workload.	Content. Readings. Thinking. Knowledge. Learning.	Reduce workload. Add more content to lectures, more and better readings, and more case examples with theory. Give more time to do the research paper. Post one complete DSM reading list. Place all assignments in the Assignments area. Make directions specific - what, where, how, and when. Fix it so that formatting does not change when using Digital Drop Box.

A future research project can explore whether the two different approaches would lead to different or the same decisions and revisions for the same materials and data.

In the social work courses, the instructor prepared a summary report for each evaluation and provided email notification of its availability. The brief report, excerpts of which appear below, clarified questions and responses to concerns. Not all concerns produced changes. Some issues had further discussion in the online office.

EMAIL

Subject: Report on Weeks 1-3, Course Evaluation

Please check the Online Office for "Weeks 1-3." There you will find a report on the course evaluation open for discussion.

ONLINE OFFICE

Subject: Weeks 1-3

Hello, everyone,

In your evaluation of the first three weeks, you expressed appreciation and enjoyment of a variety of features. They included the readings, discussions…You also had some concerns and suggestions, and I want to discuss these with you so that I will know what adjustments to make. Please reply in this discussion area, and if you would indicate the subject in your reply, e.g., "Due Dates" or …that would be helpful. ~ VOK

1. Due Dates: Some of you requested that due dates be shifted to…The only alternative that I can think might work…
2. Dumbed-Down Directions: At your FSU page (left side of screen) and in your assignments, you can access a link to the handbook for distance learners. I don't think the directions can get much more "dumbed-down" than what's already there…Have you used this handbook? If so, and you still have difficulty…
3. Workload: About this, I can offer no real relief. Students in my face-to-face class find it equally demanding…
4. Points for Discussions: I keep track of discussions, of who posts and replies, and I will look at the whole of the discussions before assigning points…As explained in the syllabus…
5. Videos: Great suggestion. I hope we will be able to do videos for the course in the future…
6. Conference or Online Chat: At this stage, I don't think we can do a conference. But we might try a chat if you like…

The fear of over-surveying students did not seem to materialize as they continued expressing perspectives about the value of the course even in weeks 16 and 17. One representative statement included *...I feel like we all worked very hard… I really had to think--how do we know what we know and what is the evidence? I think those are two questions that will stay with me for a long time…*

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Face-to-Face with an Online Expert Panel

Ludy (Ludwika) Goodson
Web Course Designer
Office of Distributed and Distance Learning
Florida State University

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Abstract: One of the values of online learning is the access to abundant resources unbound by location and schedule. But what is the value when a class meets face to face? What would be the advantages of including an online panel discussion for a face-to-face class? How would it work? In areas of controversy or when learning outcomes may include changes in dispositions, it may be particularly useful to engage the participation of an expert panel over a period of time, even when the class still meets face-to-face. An extended online panel discussion, especially when dealing with complex or emotional issues, requires preparation both for the students and the experts. In addition, they require guidance during the discussion and follow-up activities to make best use of the results. Examples from a course in family violence will illustrate the strategies and procedures that supported the success of such an expert panel discussion. This discussion spanned several weeks in the course while students met in weekly face-to-face sessions and continued with other online weekly discussions. It involved experts with varying levels of web proficiency, but equally high expertise in their fields. Because the discussion was complex and happened over several weeks, it was useful to create a structure that would maintain the openness of discussion while providing a manageable organization. Since the experts were not paid for their participation, but volunteered because of the value to the students and the lives of others, there was a need to make sure that the payoff was explicit. The presentation will identify and explain the features for preparation, discussion management, summary, follow-up to the panel discussion, and benefits.

Introduction

Discussions with an online expert panel can be crafted or simply scheduled. In a face-to-face course with weekly online discussions, how can the expert panel discussion be scheduled for convenience of the experts and alignment with other course assignments? How can the instructor use the discussion results to improve learning? To begin, the flexible, innovative, creative, analytical, and practical thinking of experts in a field gives students a model for gaining their own expertise (Hatano & Oura, 2004). These qualities are particularly valuable for adult learners with prior work experiences and varying levels of competency in the same discipline. In the online environment, the use of a guest-expert panel provides a blend of *cognitive-apprenticeship* and *computer-based learning* (Ghefaili, 2003). Task structure and organization influence the nature and quality of student interaction (Moallem, 2003). By having the questions for the panelists come from the learners, the management of the *cognitive overhead* is in their control (Whelen, 2002), provides individualization with higher *authenticity* of content focus

(Driscoll, 2000; Huang, 2002; van Merriënboer & Martens, 2002), and may operate to avoiding the *expertise reversal effect* in which too much modeling or schema construction techniques used to develop expertise (Schutt, 2003) can backfire with more knowledgeable adult learners (Kalyuga, Ayres, & Chandler, 2003).

Face-to-Face and Online Communication

The course on Family Violence Across the Lifespan, provided through Florida State University's School of Social Work in Fall 2003, was scheduled for sixteen weeks of face-to-face class meetings and weekly online support, assignments, and discussions. Dr. Veronika Ospina-Kammerer taught the course and consulted with the web course designer about online applications and aligning them with face-to-face classroom activities.

Dr. Ospina-Kammerer designed the classroom sessions for interaction with the students, including some level of problem-solving in each session. In the face-to-face class discussions, all students had the opportunity to interact with the instructor and with each other before, during, and after class sessions. In the companion online course site, all students had the opportunity to interact with the instructor and with each other at weekly discussion boards and with email communication. Dr. Ospina-Kammerer reported that the frequency of interactions in the online environment was higher than in the face-to-face class meetings, in that everyone posted something about every issue online, though students were engaged and actively discussed issues in both environments.

Course Calendar and Assignments

As with most face-to-face classes, students were expected to complete independent study outside of the classroom and online contact discussion hours. The course was planned as a seminar. The focus expressed in the syllabus was on allowing for discussion of a variety of views and approaches in dealing with abuse. Students were expected to come to the class prepared and to be able to substantiate their various points of view.

In addition to the classroom lectures, students had access online to:

- lecture notes
- research materials
- home pages that express the different professional backgrounds of the students
- rapid communication with email to students and instructor
- asynchronous communication on discussion boards
- the FSU library to do further research and add resources for topics of interest to them

Students received the following explanation about online course contact hours.

Discussion boards will include an "Online Office" discussion area for questions that may arise in between classes. Students have the added advantage of being able to submit their assignments online before the class meets by using the "Submission" function in the new Blackboard 6 course site. Students also will be able to view their progress in the course through review of the online gradebook.

The **online component** gives the students private time for study and reflection about the content and issues in preparation for the next class session. This online structure introduces a variety in the teaching methodology in a way that keeps the students on-task with the learning assignments and gives more reserved students an opportunity to express their perspectives in the online environment.

Students received the following statement about grading of discussions. The instructor gave a total amount of points and did not attribute points by week. She looked at the overall contributions and assigned a point value at the completion of discussion assignments.

Students are expected to participate in class discussions, and Online discussion boards, as well as experiential activities. Class participation grade (letter) will be based on attendance, punctuality, and overall productive contribution to discussions/exercises.

For grading, separate values were given for class v. online discussions as follows:

Online Discussion Board…………20%
Class Participation & Attendance…10%

Students received a list of required and suggested readings, including a list of journals that could serve as excellent resources for their research topics. Because of the nature of the course content, Dr. Ospina-Kammerer encouraged the students to remain aware that the readings and discussions might bring up emotional reactions and some students might need a place to explore their reactions. For this purpose, the course syllabus identified specific resources and contacts to assist students.

The instructor prepared a calendar, allowing for alternating one week for face-to-face sessions and one week for online study and discussion. The first week was planned as a face-to-face session, in which the instructor would present the schedule, and was prepared to make adjustments if the students did not want the online component as scheduled. Quizzes were administered in class. After presentation and discussion, the students chose the following calendar as originally prepared and presented.

This calendar shows only the major topics. The full calendar included each reading, discussion, lecture, and periodic research assignments and quizzes.

The weeks of classes will be alternated, meaning (Face to Face) and (Online only)!

Week 1, Introduction & Overview Aug 26, 2003 *(Face to Face)*
Week 2, Nature, Prevalence & Variety of Physical Abuse *Sept 2 (Online only)*
Week 3, Nature & Variety of Sexual Abuse *Sept 9 (Face to Face)*
Week 4, Nature & Varieties of Psychological Abuse *Sept 16 (Online only)*
Week 5, Violence, Abuse: Theoretical Interpretations *Sept 23 (Face to Face)*
Week 6, Psychological Maltreatment & Its Consequences *Sept 30 (Online only)*
Week 7, Theory on Family Abuse *Oct 7 (Face to Face)*
Week 8, Violence across the Life Course *Oct 14 (Online only)*
Week 9, Family Abuse by Gender, Race, Ethnicity *Oct 21 (Face to Face)*
Week 10, Study Break *Oct 28* (finish up research paper)
Week 11, Special Populations & Complicating Factors *Nov 4 (Face to Face)*
Week 12, Treatment and Prevention of Family Abuse *Nov 11 (Online only)*
Week 13, What Do We Know? What Is To Be Done? *Nov 18 (Face to Face)*
Week 14, Evidence based practice *Nov 25 (Online only)*
Week 15, Cultural, Social & Emotional Issues *Dec 2 (Face to Face)*
Week 16, Review & Summary

This hybrid format was particularly well suited to this course because it encouraged reflection on complex and sensitive issues in the asynchronous online discussions and allowed follow-up on them in the face-to-face sessions. Students felt confident in posting their entries in the discussion areas, including very personal sensitive matters that the instructor felt took courage to post. Some of the issues posted online were not discussed in the classroom environment; they were considered personal and private even though they were posted in the online areas. Others were, and often were at the initiative of the students. According to the instructor, the students came to the face-to-face sessions with an eagerness to deal with what they had identified as important issues arising in the online postings. The instructor facilitated and provided information from research and from knowledge of her professional discipline.

Student Activities and Assignments

In addition to reading, lecture, video review, and in-class discussion, the first week included an assignment to post a home page at the online course site. The emphasis was on sharing information about each student's professional background, experiences, and interests related to the course.

In future weeks, discussion assignments included each student's posting and discussion of information from research articles. Each student had a major research paper to submit to the instructor near the end of the term. Each week's required reading included one or more chapters in the course textbook and online lecture notes on the major topics. In the face-to-face sessions, the instructor used computer displays of course areas and lecture notes for further explanation of major themes and information. Incidentally, the students spoke up after experiencing this blended online-course-site-classroom style, asking the instructor to never again use a PowerPoint. They much preferred the leaner, cleaner, illustrated lecture note displays and discussion postings, even in the classroom environment.

In addition to submitting their research papers to the instructor, students posted and discussed them in their Week 11 online discussion board, and posted separate research summaries with discussions in Week 14.

Management Process

The process for including the expert panelists in the online course environment included brainstorming, negotiating, decision making, planning, and follow up in several areas.

- Faculty support
  - negotiate prospective role of panelists
  - negotiate prospective role of students
- Logistical support
  - align discussion with course schedule
  - identify and recruit prospective panelists and roles in online discussion for face-to-face class
  - collect biographical information to use in introductions
  - introduce panelists and instructor to each other
  - organize and post introductions at discussion area
  - prepare and post directions at discussion area
- Student support
  - structure role of student input in face-to-face class meetings
  - structure form of interactions with panelists
  - organize student input into conceptual categories for response by panelists
  - explain to students role of student input and discussion postings
- Expert support
  - describe mission for panel
  - obtain passwords for electronic campus access
  - add panelists to user list at course site
  - assist experts in try out of operations of course site
- Discussion support
  - create discussion boards for introductions and for discussions
  - prepare and post introductions at first discussion board
  - prepare and post instructions for discussion at second discussion board
  - monitor frequency, content, and attitude expressed in discussions
  - brainstorm, negotiate, and plan responses for sensitive issues
  - restrict feedback from instructor
  - treat students equally
- Learning support
  - review and identify concepts of discussions
  - prepare summary and post in discussion area
  - discuss experiences in face-to-face class meetings

The Panel Discussion

The instructor introduced the panel discussion to students in Week 3 (face-to-face) of the course. Students participated in the panel discussion in addition to their other weekly and course assignments and discussions. They had a week to preview the credentials of the panelists before they prepared their questions for submission and organization into discussion threads.

Panel Discussion - September 2003

You may start this discussion on Wednesday, September 17. This discussion will close at 11:59 p.m. on Sunday, October 5. To begin, read the introduction of the panelists below and then click on the forum title above, "Panel Discussion - September 2003."

Introduction of Panel Experts

The names are listed in alphabetical sequence.

- **Denita Lamar-Black** Assistant Director of Florida State University's Victim Advocate Program. Her previous experience includes crisis counseling through Telephone Counseling and Referral Service and on-scene crisis intervention through her work as a Victim Advocate with the Leon County Sheriff's Office. She formerly served as president on the Board of Directors of the Big Bend Victim Assistance Coalition, an organization dedicated to promoting advocacy and awareness of victims' rights.
- **Dennis LaRosa** A volunteer victim services practitioner in the Tallahassee Police Department Victim Advocate Unit. He is a non-practicing attorney who now works for the Agency for Health Care Administration. Mr. LaRosa has 15 years experience in domestic violence cases, is a guest speaker and teacher on issues of domestic violence, and is a grant recipient from the Governor's Task Force on Domestic Violence to create a model for domestic violence courses in county and city jails. He taught courses about domestic violence in Florida prisons to women inmates for six years and to male offenders for one year.
- **Jill McArthur** Lead victim advocate in the Tallahassee Police Department Victim Advocate Unit, one of the founders of this unit, a first responder group. She is past-president of the Big Bend Victim Assistance Coalition (BBVAC-BeeBeeVac), group of public providers and volunteers who work and volunteer in this field. She has 10 years experience in the child abuse/neglect field with the Child Protection Team (a mandated contract service provider for HRS - DCF which provided video interviewing of child victims, assessment and coordination of medical, psychological and treatment recommendations) and as an Investigator.

To prepare for the panel discussions, the instructor discussed the plans with the students and each student prepared a list of three questions about their most important concerns. The instructor brought this list to the course designer who worked with the instructor in organizing the questions into categories. Meanwhile the panelists were given access to the course to review the course content and practice the operations needed to view the discussion boards and post their responses to students.

To prepare for posting their responses, the course designer provided the panelists with the questions organized into threads for discussion, short subject labels to use with each question, and encouragement to use these same subject labels in replies in the discussion area. Each question included the name of the student who had asked the question. This same information was posted in each thread of the expert panel discussion area.

Results

After reviewing the list of questions and student names, the experts alerted the faculty and course designer about the nature of some of the questions and their patterns. They indicated the need for caution on one issue and took about a week to consult with other experts before responding in the discussion area with information, research, and clarification. The issue reflected biases that would interfere with recognizing and responding to family violence. In the interim, the panelists and students proceeded with online discussion in response to each thread, with follow up discussion in the face-to-face classroom. Later in the course, the instructor reported that the students brought up their own concerns about the biases expressed in the discussion area when they met in their face-to-face contact time. They took the initiative to follow up in their class discussions to make sure that the issue would be resolved regarding the biases about abuse, perpetrators of abuse, and defense of abuse.

After the first week of discussion, the course designer and instructor reviewed the questions that had been answered and those that had not been answered. The graduate assistant posted the status in the discussion area. The instructor alerted the panelists to the status report in the discussion area.

Course statistics show high frequency of participation compared to other discussion areas: 103 messages had been posted; 9 threads, 54 expert replies, 41 student replies, and one summary statement by the instructor for student review of issues. Course statistics showed about 18% of student hits (24 students) from August 26, 2003 through December 9, 2003, compared to a range of about 2% to 5% for others, as shown in the following chart of course statistics. The higher degrees of interactivity and the quality of interactions suggest more *real learning* (Draves, 2000, cited in Chou, 2003). This high online interactivity may be due to the ease of access to the guest experts, the amount of learner control, the convenience of asynchronous posting, the *information rich* contributions of both panelists and students, the non-linear access to information, and the alignment of feedback from experts to the questions asked by the students (Heeter, 1989, and Higgenbotham-Wheat, 1991, cited in Chou, 2003).

Class Cafe and Lounge	98	1.64%	Week 7	306	5.12%
Library Research	170	2.84%	Week 8	290	4.85%
Online Office	204	3.41%	Week 9	294	4.92%
Panel Discussion - September 2003	1063	17.79%	Week 11 - part 1	183	3.06%
Week 1	557	9.32%	Week 11 - part 2	206	3.44%
Week 2	338	5.65%	Week 12	360	6.02%
Week 3	179	2.99%	Week 13	204	3.41%
Week 4	323	5.40%	Week 14	307	5.13%
Week 5	314	5.25%	Week 15	276	4.61%
Week 6	293	4.90%	**Total**	**5975**	**100%**

A review of discussion postings showed the following results:

- Every question asked in the initial threads was answered by replies from experts and students. Students read replies even when they did not post replies themselves, as shown in the following chart.
- Discussion continued to resolve sensitive issues by information and research to educate students and correct misconceptions.

These results align well with findings from other experiences in which a virtual guest appearance with threaded discussions supported reflection, research, and the construction of knowledge (Wearmouth, Smith & Soler, 2004). Although the virtual guest was in a teleconferencing environment rather than an asynchronous discussion area, the kind of information shared was similar, e.g., references to policy documents, examples of practice, journal articles for reference, as was the theme of problem-solving in electronic exchanges.

	Readings Per Thread	Number of Expert Replies	Number of Student Replies	Average Readings Per Reply
Thread 1: Types of Abuse	93	9	6	28
Thread 2: Causes, Perpetrators	75	9	6	27
Thread 3: Incidence Reports	70	3	1	27
Thread 4: Responding, Arresting, Restraining	61	7	3	30
Thread 5: Biases	58	9	7	24
Thread 6: Protecting Children	47	1	3	22
Thread 7: Penalties and Tracking	44	4	2	20
Thread 8: Intervention, Prevention	66	8	5	40
Thread 9: Controversies (remaining questions of controversy after review of threads)	55	4	8	31
		54	41	

<u>Note</u>. The number order of experts in the following chart does not match the alphabetical listing of names in the acknowledgement, but shows instead the order of posting to the discussion area.

Thread 1: Types of Abuse

Expert 1 (Worst Case)	32	Student (Worst Case)	29
Expert 1 (Child Discipline)	29	Student (Worst Case)	31
Expert 1 (Elder Abuse)	34	Student (Worst Case)	25
Expert 1 (Child Left Alone)	30	Student	32
Expert 2	27	Student	27
Expert 2 (Elder Abuse)	28	Student	26
Expert 3	24		170
Expert 3 (Child Left Alone)	23		
Expert 3 (Child Left Alone)	23		
	250		

Thread 2: Causes, Perpetrators

Expert 1	29	Student	42
Expert 1	26	Student	31
Expert 1	17	Student	35
Expert 1 (Drug Use)	26	Student	31
Expert 3 (Recession)	21	Student	30
Expert 3	22	Student	21
Expert 3	25		190
Expert 3	21		
Expert 3 (Drug Use)	20		
	207		

Thread 3: Incidence Reports

Expert 1 (Highest)	27	Student	34
Expert 1 (Male Victims)	25		
Expert 3	20		
	72		

Thread 4: Responding, Arresting, Restraining (Victim Support)

Expert 1	31	Student	34
Expert 1 (Mandatory Arrest)	30	Student	35
Expert 1 (Mandatory Arrest)	22	Student (Mandatory Arrest)	26
Expert 1 (Statute of	20		95

Limitations)		[redacted]	
Expert 2	55	[redacted]	[redacted]
Expert 3	21	[redacted]	[redacted]
Expert 3	23	[redacted]	[redacted]
[redacted]	202	[redacted]	[redacted]

Thread 5: Biases

Expert 1 (Believing the Female)	47	Student (Believing the Female)	32
Expert 1 (Believing the Female)	26	Student (Believing the Female)	29
Expert 1 (Believing the Female)	19	Student (Believing the Female)	26
Expert 1 (Believing the Female)	9	Student (Believing the Female)	31
Expert 1 (Same Sex Partners)	21	Student (Believing the Female)	19
Expert 2	16	Student (Same Sex Partners)	18
Expert 2 (Believing the Female)	28	Student (Same Sex Partners)	18
Expert 2 (Believing the Female)	26	[redacted]	173
Expert 2 (Believing the Female)	21	[redacted]	[redacted]
[redacted]	213	[redacted]	[redacted]

Thread 6: Protecting Children

Expert 3	25	Student	19
[redacted]	[redacted]	Student	24
[redacted]	[redacted]	Student	21
[redacted]	[redacted]	[redacted]	64

Thread 7: Penalties and Tracking

Expert 1 (Pending Legislation)	16	Student (Pending Legislation)	18
Expert 1 (Lawmakers)	21	Student (Lawmakers)	24
Expert 3 (Lawmakers)	21	[redacted]	42
Expert 3 (Children of Abuse)	17	[redacted]	[redacted]
[redacted]	75	[redacted]	[redacted]

Thread 8: Intervention, Prevention

Expert 1	66	Student	68
Expert 1	42	Student	42
Expert 1	44	Student	33
Expert 1	29		143
Expert 1	30		
Expert 1 (Schools)	30		
Expert 3	30		
Expert 3	27		
	298		

Thread 9: Controversies

Expert 1 (Helpless)	30	Student	40
Expert 1 (Jail)	20	Student	34
Expert 3	19	Student	29
Expert 3 (Helpless)	17	Student	25
	86	Student	23
		Student	22
		Student	10
		Student	8
			191

The web course designer and instructor reviewed the discussion to analyze the main issues and information that had emerged in the discussion. They organized this information into conceptual categories and prepared a summary statement for each topic. The instructor posted a summary statement following the close of discussion and posted the summary for each main topic immediately after in separate discussion areas.

All students including the instructor are immensely grateful for the panelists' candid responses. The panelists and students in this discussion have given us knowledge and perspectives that will help us to better handle family violence. Some thank you notes for our experts have been posted in the Online Office. Others may be posted in the original Panel Discussion Board below. Please, have a look at the summary sections, and DEAR PANELISTS, THANK YOU VERY MUCH from ALL OF US IN the Family Violence class, Fall 03 and the instructor.

To do the summary, I've posted several *forums* to capture important themes from this panel discussion. Please review them all, paying particular attention to *Strategies for Support*:

- History
- Victims
- Perpetrators
- Strategies for Support
- Law Enforcement
- Reporting

> If you feel that I've left out anything important, please click the forum title and add "add new thread." You also may add new threads to the following topics.
>
> *Dr.VOK*

Six of the 24 students posted expressions of appreciation for the panel discussion in the instructor's online office area. The following sample posting from one of the students summed up the instructor's impression of the contribution of the online panel discussion to the class.

> THANK YOU! I just want to take the time to express my appreciation for your time and expertise. It was very helpful to add your professional perspective to our points of view as well as give us the opportunity to open a dialogue that may not have happened if you did not participate.

Furthermore, it was the consensus of the instructor and the panelists, upon comparing the exchanges in the panel discussion area with the classroom exchanges, that the students deepened their understanding of several complex and sensitive issues and with a change in attitudes for at least one student deemed to be critical to effective practice in the discipline. The wider context, the views of different perspectives, the grappling with concepts, and the equality of participation may account for this quality of learning (Cunningham-Atkins, Powell, Moore, Hobbs & Sharpe, 2004). The social context of interactions may account for the learning (Knowles, 1990, Martin & Reigeluth, 1999, and Vygotsky, 1978, all cited in Moallem, 2003) especially since emotions, feelings, and motivation are considered important in social work practice dealing with family violence. Regardless of theory basis, it may be due to the blended treatment of the discussion, i.e., face-to-face discussion with the online component, as some students regularly post messages, some read and do not post, and some read and occasionally post (Weller, 2002, cited in Cunningham-Atkins, Powell, Moore, Hobbs & Sharpe, 2004), so that the blended environment adapts more to variations in learning styles. Additional qualitative analysis of postings could suggest the more likely reasons.

Future Exploration

This discussion with an online panel of experts included the following features:

- online and face-to-face learning
- small class size (n=24)
- whole-class discussion
- students asked the top three questions most important to each of them
- students viewed credentials of guest experts before asking their questions
- questions were grouped into conceptual categories
- names of students who asked the questions were included in the preview list submitted to the panelists as well as the students

- answers provided in the discussions by panelists as well as students were classified in a similar manner to produce the summary after the close of the panel discussion

While the focus was relatively goal-free, presumably a more effective strategy for adult learners, the emerging questions and answers were structured to produce major themes, potentially serving as schemata for the organization of information (Schutt, 2003). The instructor and web course designer selected the amount of activity structure and rules to provide to this learner group (Jonassen & Rohrer-Murphy, 1999, cited in Moallem, 2003). Should it have been less or more? The summary functioned as organized feedback to the students (Driscoll, 2000). How much online feedback and of what type will be productive (Oberle, n.d.)? The whole class of 24 students participated in the same discussion board. Would small-group interaction have been more or less effective and more or less satisfying to the students (McGrath & Hollingshead, 1993, cited in Moallem, 2003)? Perhaps small groups could have reached consensus on a list of top three questions from their group, contributing these to the larger class forum, thereby sharpening and simplifying the focus of discussion.

Future work also could use systematic qualitative analysis of the data to examine the impact on defined learning outcomes. The effect of strategies in a fully online environment could be compared to the blended environment. Alternatives strategies in the blended v. online environments might include comparing solicited and organized questions to simply entering the discussion forum and asking questions to initiate the discussion with the panelists. Another alternative would be for the panelists to prepare at least a month in advance with the instructor the major themes to use as the threads in the discussion area. Finally, the structure of organizing the answers into conceptual categories for the follow-up summary could be compared to the absence of a summary at all.

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Student Computer Support Needs: Computer Anxiety, Confidence and Mediation of Support Needs.

John H. Griffin, Ph.D.
1108 S. Stanley
Stillwater, OK 74074
(405)377-3666
jhg60@hotmail.com

INTRODUCTION

Computer anxiety has been a significant problem in education, business, and industry (Raub, 1981; Weil & Rosen, 1997). According to Weil and Rosen (1997), up to 50% of the population may have varying degrees of technology-related anxiety that can interfere with certain aspects of their lives at home, at work, or at school.

The computer age is here, and the role of the computer has shifted from being predominantly a tool for mathematics and programming that many students and educators could avoid, to being a tool that provides interactive communication functions that are rapidly becoming essential to the educational process. As more instructors go online, the technology of computers has become the defacto standard for students and instructors alike (Raub, 1981; Rosen & Maguire, 1990, Sherry, 2000). The extent of computer use in education has increased and so has the nature of computer usage and expectations (Overbaugh & Reed, 1994-1995). Because the computer is now a medium for education, the effects of computer anxiety extend into students lives in many ways. How students with differing degrees of computer anxiety prefer to get help along the way to learning is an important support issue.

Purpose of the Study

Of primary interest in this research was whether computer anxious students and their non-anxious counterparts would select different media for support when learning to use technology. In other words, do computer anxious students select different types of mediation of support, such as human or paper-based help over machine-based help, than do the non-anxious?

Rationale

The rationale behind this research is that anxious and non-anxious students come to the computer-based learning environment with different prior experience, goals, and support needs, and that they may also differ in their perceptions about what type of support they need in order to succeed in given tasks (Mitra, 1998; Potosky & Bobko, 1998). Students may vary greatly both in their combinations of types of specific computer anxiety (anxieties about possible damage to the

machine, or loss of self-respect, etc.), and in the intensity of their anxiety (arousal levels) which relates to the levels of confidence they have while using the computer as a learning tool (Bull, 1999; Weil & Rosen, 1997). Students' perceptions of their support needs, and preferred mediation, may well be related to their computer anxiety, depending on their individual level of arousal.

In the instructional arena, many factors affect student computer use or non-use. Students may see their computer-based learning experience either as threatening, as being an attractive alternative to the traditional classroom, or as entertaining and fun (Csikszentmihalyi, 1996). In addition, various avoidance patterns may explain students' failure to use computer-related technology for communication and learning, and each student can conceivably have different preferences and affective states (anxieties) related to what he or she considers the most useful and efficient technology for getting help. Likewise, students can vary both by types of experience (software, hardware, and Internet) and amount of experience, in other words, both the breadth and the depth of experiences (Mitra, 1998; Potosky & Bobko, 1998).

Theoretical Framework and Research Question

Regardless of whether one defines failure as drop-out rates or greater number of course incompletes (I), technology-dependent courses and distance learning courses are notorious for their high attrition rates. Computer-based distance learning in particular is plagued by persistently higher attrition rates that are largely due to the "dizzying array of challenges" (Phipps, 2000, p. 7) presented to students in terms of new skills and support they will need in order to successfully complete their course work. These factors tend to create a complex and sometimes highly threatening learning environment – the worst possible learning environment for the least able students, who may find these situations overstimulating.

A report to the Institute of Higher Education Policy prepared for the National Education Association and American Federation of Teachers points out that while support is a critical issue in distance learning, very little research has been done within a theoretical framework to explain differences based on individual affective states and support needs or to address individual differences across differing technology applications in this learning environment (Phipps, 2000). This research seeks to reduce that gap. It borrows from Vygotsky's (1978) work on scaffolding to examine the complex nature of students' affective states in a given technological environment and their perceived support needs. This research is concerned with the relations among the students' computer anxiety levels, and their respective choice of mediation for scaffolding (human, machine, or paper). This research topic can be broken down into the following question: Do students of high and low computer anxiety levels differ in their preferences for mediation of support?

Background

Scaffolding for Support

Much of Vygotsky's (1978) work dealt with understanding childrens' development in terms of the socio-cultural influences in their knowledge acquisition and the mediation of knowledge from adults or experts to children who are novices. His research showed that knowledge first exists external to the individual, being stored in, or embedded in structures that humans create to serve as their tools, whether in the form of a hammer, a calculator, or linguistic tools such as words and concepts. Knowledge is also viewed as being embedded in socio-cultural tools such as language, rules, and art forms that give structure to the individual's externally shared environment. Those who are knowledgeable and perceptive and understand the novice's needs, can often mediate that knowledge and help the novice to understand and improve behaviors by modeling socially approved behaviors, by giving step-by-step demonstrations, or by translating hidden meanings into simpler words and concepts that the novice can understand. That is, the more knowledgeable person serves as a coach. The coach must diagnose a problem or deficiency and evaluate the needs of the learner and then she may make appropriate adjustments to the environment or give suggestive feedback to the learner.

Vygotsky (1978) pointed out that two persons of the same apparent abilities or skill levels may differ in their ability to use various forms of knowledge and support structures (differential readiness), which is reminiscent of Cronbach and Snow's (1977) perspectives on Aptitude-Treatment-Interaction (ATI), also known as Attribute Treatment Interaction (Sieber et al., 1977). Scaffolding is the supporting process in which a person of greater knowledge or experience assesses a novice's problem in comprehension or completion of a task and provides an appropriate clue or suggestion, or uses similar strategies to help the novice complete the task successfully. After successful completion of a task and confirmation that the task can be completed independently, the support is faded out.

In any group of students there are those who are not ready to grasp a given skill or concept because they lack certain basic prerequisite knowledge or experiences. Others may be at a point in their learning where they are almost, but not quite, able to perform a task without assistance. They simply need some scaffolding in the form of explanations, demonstrations, hints, or clues as to the next step. They may, for example, only need answers to a few strategic questions in order to help them re-organize their thoughts, or help them notice previously undetected patterns that are significant for understanding a new concept. We say that the latter group can benefit from scaffolding, which is the appropriate help provided by a knowledgeable person, in a live setting or in the form of a tutorial, that enables a person to achieve a learning task that they would not otherwise have been able to complete independently (Vygotsky, 1978).

Vygotsky, in dealing with children's developmental issues, found that support scaffolding must be appropriate to the person's developmental stage. While lack of support may make learning more difficult, premature or inappropriate support may also be useless because it will fail to make any sense to the novice, which explains why diagnosis and good communication skills are important for scaffolding to work. Ideally the support system is in place to allow

someone to observe a problem, diagnose it, and provide appropriate feedback that will lead the student to a solution. As the novices grow and develop, they learn to master one environment gaining more understanding of the current situation, and soon faces an essentially new environment that serves to create new opportunities and challenges.

As the competence levels of student computer users move beyond simple skill levels, users are also better able to see the potential for improvement or usefulness, as well as gain the ability to work faster and smarter in new interest areas. This of course assumes the individual has the requisite positive attitudes, adequate levels of experiences, and the confidence that they can succeed if given the right tools and support.

Individual Needs

Online students usually need at least two major kinds of information: Computer technical support (for the learner-as-user) and course-content-related information (for the learner-as-learner). For those with excessive computer anxiety, non-essential concerns and negative reactions may consume excessive time and energy; therefore getting the computer problems out of the way (and off their minds) could clear the road for the students to get back on track, to focus on the course and its content rather than on the technology involved. Smooth sailing at this point of entry into the course may well prevent the intrusion into the learning process of recursive negative thought patterns (Guzdial, n.d.).

Timeliness in getting the help one needs, when it is most appropriate, is an important step in reducing the loss of positive attitudes and energy at a critical time in the beginning of the learning curve. But how does each person seek out help and get it? The computer anxious and non-anxious students do not appear to be alike in terms of the quality and quantity of help they need in order to perform well. Ropp (1999), in her research with computer coping strategies, found that computer anxious students used fewer coping strategies and fewer variations in strategies than did the less anxious students. Her work also coincides with research from other fields, showing that anxious students have a narrowed focus of attention and use less productive strategies in dealing with the world around them. If this pattern holds for getting computer support, it implies that computer anxious students may well communicate differently (less efficiently and effectively) in their help-seeking behaviors, or seek help from less efficacious methods. It is quite possible that the students who are most computer anxious will communicate differently as they gain more experience. There is certainly reason to believe that the more anxious students will interact in less productive, or even counterproductive, communication patterns than do non-anxious students (Allen and Bourhis, 1996; Proctor et al., 1994; Schumacher & Wheeless, 1997), but there is little empirical information about possible differential help-seeking behaviors in these new teaching and learning environments.

Just as in traditional teaching/learning settings, there is typically, for each student, a unique level of, or combinations of, intellectual and emotional development for a task-specific situation that provides enough information and structure to match needs and abilities while simultaneously providing just enough ambiguity to maintain motivation. Either a lack of background skills and experience, or excessively high expectations can translate into

excessive ambiguity, progressive worry and anxiety, and ultimately avoidance of the threatening computer task. Isolation, which can be a very real problem in certain online settings, can exacerbate the students' feelings of helplessness and entrapment when they cannot communicate in meaningful ways with those who could possibly help them. Computer user anxiety, especially if combined with negative attitudes, can result in computer avoidance and limit the students' cumulative exposure, or lead to selective patterns of experiences with computer-based technology. Obviously these same factors can also restrict student access to the computer-based communication channels they need, but may in fact abhor, especially when they have negative emotions and anxiety about future encounters with lowered expectations of getting useful information (helplessness). The irony here is that the tool with the most potential to provide help may actually be the tool least likely to be considered by the computer anxious student (Ropp, 1999, Sherry, 1998).

Student Perceptions in Self-Reports Assessments

Kruger and Dunning (1999) found that unskilled students have overly favorable views of their own abilities. This lack of self-awareness occurred most often among those with the greatest deficits in relevant skills, and they found that improving relevant skills reduced the students' over-estimation of their abilities. They claim that overestimation due to incompetence leads one to a dual burden. The person who is incompetent may not only fail at a given strategy, but also lack the ability to recognize their own deficiencies in skills. This may also be a problem in the support arena.

Tapin, et al. (2001) examined academic help-seeking strategies of high and low achievers in a distance learning setting. In a series of questions that reflected instrumental and executive types of strategies, they found that the high achievers more often asked for instrumental help which is process oriented and places more responsibility on the student than does executive help. In their findings, instrumental strategies are more efficacious than executive level help. Except for questions clearly related to course work, the majority of their students sought help from family, friends, or other students.

METHODOLOGY

For this research an instrument package was created to set the students' mind on specific tasks and then ask them to mark their preferred source of support that they felt they would need in order to improve their skills, and then to mark their confidence in completing the task after getting such help. This form was completed by 612 undergraduate students from Oklahoma State University.

Assessment Tools

Computer Attitude Scale - Anxiety (CASA)

Computer anxiety was measured with the Computer Attitude Scale - Anxiety (CASA) a subscale of the Computer Attitude Scale (CAS) developed by Loyd and Gressard (1984a). This instrument was chosen because of its proven track record in reliability and (Loyd, & Gressard,

1984a; Loyd, & Loyd, 1985) and validity (Chua, Chen, & Wong, 1999; Gressard & Loyd, 1986; Loyd, & Gressard, 1984a; Loyd, & Gressard, 1984b; Woodard 1991). The CASA instrument included ten items and each is rated on a four-point likert-like scale (Strongly Agree = 4, Slightly Agree = 3, Slightly Disagree = 2, Strongly Disagree = 1), with half of the items being reverse coded. The reliability coefficient (Alpha) for internal reliability is 0.90.

Scaffolding Assessment

The student scaffolding assessment tool used here, *Computer Scaffolding Instrument* was created by a research team (Bull & Overton, 2000; personal communication) and modified by the researcher, using feedback from various faculty and graduate students in the College of Education. In the summer and fall of 2001 the Scaffolding assessment package was pilot tested with technical experts, a technical writing instructor, an English instructor, and students of various majors and levels. Formative feedback was gathered from instructors and outside professionals, as well as from students and non-students alike, of various interests, including professions in the distance learning area. Students and teachers completed the package and provided think-aloud feedback as they proceeded through each section. These comments and suggestions led to improvement in the layout and readability of the end product.

Categories for Mediation of Support

Students' preferred source of help, which amounted to their preferred mediation for support, was ascertained by the assessment package. The nine options for help are listed below, along with the categories of mediation for each. Students responded to this section as shown below:

C. For each item below circle the ONE type of help you need most in order to **improve your level** of performance:

I prefer help from: 1). a friend 2). a tutor or nearby expert 3). a teacher
4) drop-down help windows 5). instructions/FAQ's from Internet/online 6) an intelligent program 7) an instruction manual 8) a manual such as *Windows for Dummies*, 9) a comprehensive textbook/program or course

These nine response options were subsequently collapsed (Shavelson, 1988) into three categories for types of mediation of support: human support (HS - options 1 through 3), machine support (MS - options 4 through 6), and paper support (PS - options 7 through 9). These options are thought to reflect the differences in interactivity and complexity in types of support options that are commonly used in the electronic classroom. These response options are categorized below by type of mediation used:

Human Support mediation (HS)

1) Friend
2) Tutor
3) Teacher

Machine Support mediation (MS)
4) Drop Down (menus)
5) Search Internet
6) Interactive Intelligent

Paper Support mediation (PS)
7) Instruction Manual
8) After-market
9) Textbook

Research Participants

The scores from the CASA instrument were then used to divide the students into two groups with a median split of the population, creating high and low computer anxiety groups (CAGs). As is often done in anxiety studies (Cronbach and Snow, 1977; Sieber, et al. 1977), the scores from the CASA instrument were used to divide the total population of 612 students into two approximately equal size groups, based on a median split on the range of scores, with 315 (with scores of 13 to 35) students in the high computer anxiety group (HCA), and 297 (with scores of 36 to 40) in the low computer anxiety group (LCA). The CASA instrument was created to be used along with a set of instruments in which higher scores represent more positive attitudes, and that standard has been kept, such that the higher the CASA score, the lower is the student's computer anxiety (more positive their attitude).

The students' *choices for support*, which consisted of one of nine possible support options for each of the 21 tasks. These choices are referred to here as their *vote(s)*, represent their perceived need for support; they are essentially their task-specific votes for support. Since there were 21 tasks, the number of possible votes of support, by a given option, could vary from zero for a specific support option (no votes for machine support, for example) up to 21 votes, for example, for the use of human support for each task. These counts of votes were used in the comparisons of the two different computer anxiety groups.

Even though it was not expected that students would all vote for the same method of support, the SPSS non-parametric goodness of fit test, with a Pearson Chi Squares test of significance analysis was performed to test for a significant difference in the patterns, or distributions of preferred votes for support on each of the 21 different tasks, and compared for the entire student population as well as for high (HCA) and low (LCA) computer anxiety groups. In order to adequately and clearly discuss the results by contectualized tasks, the 21 tasks were factor analyzed, which reduced the number of tasks to three typical tasks : 1) Presentation and Production, 2) Communication, and 3) Technical tasks.

Analysis

Votes by Mediation of Support

Of interest here was the mediation through which support was to be provided, not simply preferences for support options themselves. Because there were 189 possible combinations of 21

tasks (later three task-factors) by 9 support options (or three types of mediation), it was also necessary to collapse (combine) the nine support options into their respective forms of mediation (Shavelson, 1988). The totals for these collapsed options are referred to here as *votes for scaffolding.* Excessive information was thus reduced while the nature of support was expressed in terms of the mediation involved.

Task-Factors

A factor analysis, with oblique Harris-Kaiser rotation (Gorsuch,1983), was run on the 21 scaffolding support options to reduce the number of tasks, clarify the concepts involved and simplify the final interpretation. The original tasks were reduced to three conceptually relevant task-factors (equivalent concepts) that are called: 1) the Technical Factor, 2) the Communication Factor, and 3) the Production & Presentation Factor Gorsuch, 1983). The factors are shown below.

The six tasks that went into the Technical task-factor (Tech):

Task 9. Install and use a web cam on your computer
Task 13. Add a printer and the printer related software
Task 15. Download and install software to use streaming audio or video
Task 18. Install software on your computer
Task 19. Use FTP to upload a file
Task 20. Install a modem and its software

The five tasks that went into the Production and Presentation task-factor (P&P):

Task 1. Use word processing software such as Microsoft Word, Word Perfect, etc.
Task 2. Subscribe to, and participate in a Listserv
Task 3. Manipulate data, e.g., Excel, Access, Lotus 1,2,3, etc.
Task 4. Use presentation software, e.g., Power Point, Photo Delux, Illustrator, or similar
Task 5. Use design programs, e.g., Netscape Composer, Lotus Domino, Page Mill, Front Page, etc. to create a web page

Six tasks that went into the Communication and Communication Tools factor:

Task 6. Use Email programs
Task 7. Talk to others in an online chat room
Task 8. Talk to others using an Internet telephone
Task 10. Download files from the Internet
Task 12. Browse and search the Internet for academic articles
Task 17. Use one of the instant messaging services

Four tasks were ambiguous and failed to load cleanly on any one factor but partially loading on two or more factors:

Task 11. Use drawing programs to create your own artwork
Task 14. Create folders, save, rename, and copy files on your computer
Task 16. Use threaded discussion data bases for academic group discussions
Task 21. Use Boolean logic with an online search engine to find information on the web

The number of votes, by mediation of support, for each of the newly conceptualized tasks, was computed yielding numbers for these categories, each of which was then compared individually by computer anxiety groups using chi square analysis:

Technical factor–human support
Technical factor–machine support
Technical factor–paper support
Communication factor–human support
Communication factor–machine support
Communication factor–paper support
Production and presentation factor–human support
Production and presentation factor–machine support
Production and presentation factor–paper support

Non-parametric, Chi Squares analysis was run individually on each of the scores for each of these new variables. These nine *task–factors by mediation of support* combinations were analyzed individually by their counts, similar to the overall simple tally of votes discussed above, in order to answer research question 1 about differences in choices for each of the nine types of task-factor-by-support options. These numbers were used to compute the crosstabulations used in answering the research question. Values for the computation of the Chi-squares were derived from the count feature in SPSS and the results were compared by computer anxiety groups. Each of the nine task-factor-by-support combinations was compared by computer anxiety groups to test for differences between the two populations, rather than testing for differences between the combinations themselves.

RESULTS

Computer Anxiety

Loyd and Loyd (1985) reported a mean score of 32.1 based on a pool of 114 teachers. In another study, by Gressard and Loyd (1985), 196 teachers in a computer course, with a pre and post measure of computer anxiety had means of 29.83 and 33.36 respectively. Mean computer anxiety score for this sample was 33.75 (S.D. 5.97) with a median of 35 which may be a little less anxious than the average population due to greater computer experience in high school and college.

Anxiety, Arousal, and Splitting Students

Cronbach and Snow (1977) discussed the use of Aptitude Treatment Interaction (ATI) in situations where the population is expected to perform differentially on a given factor, and Sieber, et. al (1977) used ATI in a similar fashion for their work on anxiety in instruction. In line with their research on anxiety, the Yerkes-Dodson (1908) arousal-performance curve, an inverted U curve, suggests that there are approximately three combinations of arousal and performance conditions. First, those who are on the lower side of the arousal curve are under-aroused and can be thought of as less mentally and physically primed, and less ready for performance; they are non-attentive, etc. In the middle of this theoretical continuum, at the peak of the curve, is the second group, those who are at medium levels of arousal and their minds and bodies are fully alert, functional and more likely to be motivated. The psychological state of flow (Csikszentmihalyi, 1996) can occur in this state. To the extreme on the continuum, is the third group, those who are most highly aroused, and usually described as being excited, agitated, and

perhaps in a state of panic. This third group consists of those who are over-aroused, and may be easily overstimulated by external stimuli, if they aren't already. Those who are on the opposite ends of the arousal-performance curve behave differently. This is the ideal setting for the analysis of the two extremes of population.

As is often done in anxiety studies (Cronbach and Snow, 1977; Sieber, et al. 1977), the scores from the CASA instrument were used to divide the total population of 612 students into two approximately equal size groups, based on a median split on the range of scores with 315 (with scores of 13 to 35) students in the high computer anxiety group (HCA), and 297 (with scores of 36 to 40) in the low computer anxiety group (LCA).

Creating Computer Anxiety Groupings (CAG)

SPSS was used to create a median split of the student population into two approximately equal groups based on their computer anxiety (CASA) scores: Group1 - Highest Computer Anxious (HCA) and Group 2 - Least Computer Anxious (LCA). Because the scale was originally created to measure positive attitudes, scores of computer anxiety are inversely related to actual computer anxiety.

Table 1

Composition of Computer Anxiety Groups

Groups	Range of scores	N	Means
High computer anxiety	13 - 35	315	29.19
Low computer anxiety	36 - 40	297	38.59
Overall	10 - 40	612	33.75

Research Question

Research Question

Student preferences for support were parsed out, that is calculated, for each task-factor by each of these methods of mediation of support: human, machine, and paper. The descriptive statistics for the resulting task-by-support scores, on each possible combination are shown by in Table 2 below for each computer anxiety group.

Table 2

Descriptive Statistics for Scaffolding by Task-Factors for Each Computer Anxiety Group

Task-factor by Support	HCA Group N	Sum	%tags	Mean	Std. Dev.	LCA Group N	Sum	%tags	Mean	Std. Dev.
TF[a] – HS[d]	303	1407	**74.7**	4.644	1.794	235	1059	**59.7**	4.506	1.815
TF – MS[e]	74	156	**8.3**	2.108	1.288	107	311	**17.5**	2.907	1.876
TF – PS[f]	110	321	**17.0**	2.918	1.551	128	404	**22.8**	3.156	1.714
CF[b] – HS[c]	310	1633	**87.0**	5.268	1.281	259	1296	**73.1**	5.004	1.472
CF – MS	82	171	**9.1**	2.085	1.307	115	334	**18.8**	2.904	1.947
CF – PS	44	74	**3.9**	1.682	1.289	65	143	**8.1**	2.200	1.716
P&PF[c] – HS	299	1248	**79.5**	4.174	1.244	263	1035	**70.0**	3.935	1.36
P&PF – MS	76	135	**8.6**	1.776	1.066	101	235	**15.9**	2.327	1.511
P&PF – PS	86	186	**11.9**	2.163	1.235	92	208	**14.1**	2.26	1.436

[a] Technical Factor
[b] Communication Factor
[c] Production and Presentation Factor
[d] Human Support
[e] Machine Support
[f] Paper Support

In Table 2 above, note that *N* equals the number of students who voted, whereas Sum and Percentages represent the actual number of votes cast for a given method of support for each of the three task-factors. Note that the percentages differ most radically between the HCA group and the LCA groups on the issue of machine support on all three types of tasks, which represent types of tasks.

The Chi-square test of independence was used to test for any significant differences between the two populations of students in the two different computer anxiety groups. Table 3 below shows that computer anxious students in particular have different preferences for support, and that they especially avoid machine-based support, regardless of the particular task involved.

Table 3

Chi-squares Tests of Significance for All (Task Factors by Mediation of Support) Scaffolding Possibilities

Scaffolding possibilities	χ^2	significance	df
Technical Factor with HUMAN Support	3.024	.696	5
Technical Factor with MACHINE Support	18.735	.002	5
Technical Factor with PAPER Support	9.713	.084	5
Communication Factor with HUMAN Support	6.323	.276	5
Communication Factor with MACHINE Support	16.14	.007	5
Communication Factor with PAPER Support	6.266	.281	5
P&P Factor with HUMAN Support	6.064	.194	4
P&P Factor with MACHINE Support	9.475	.050	4
P&P Factor with PAPER Support	4.211	.378	4

Table 4 below shows that for the Technical factor, 74.7% of the High Computer Anxiety group (HCA) voted for some form of human support, but only 59.7% of the Low Computer Anxiety group (LCA) did so. Numbers for the paper support options were about equal for the HCA and LCA groups, but the machine support differed by a factor of almost 2-to1.

Table 4
Comparison of Differences in Technical Task-Factor as a Function of Computer Anxiety Group

	HCA		LCA	
Task-factor by support	Counts	%	Counts	%
Technical factor with human support	1407	74.7	1059	59.7
Technical factor with machine support	156	8.3	311	17.5
Technical factor with paper support	321	17.0	404	22.8
Totals	1884	100	1774	100

Table 5 below shows that for the Communication factor, 87% of the HCA group voted for some form of human support, but only 73.1% of the LCA group did so. Numbers for both the machine and paper support options differed by a factor of about 2-to-1 between the HCA and LCA groups.

Table 5
Comparison of Differences in Communication Task-Factor as a Function of Computer Anxiety group

	HCA		LCA	
Task-factor by support	Counts	%	Counts	%
Communication factor with human support	1633	87.0	1296	73.1
Communication factor with machine support	171	9.1	334	18.8
Communication factor with paper support	74	3.9	143	8.1
Totals	1878	100	1773	100

Table 6 below shows that for the Production and Presentation factor, 79.5% of the HCA group voted for some form of human support, but only 70% of the LCA group did so. Numbers for both the machine support option differed by a factor of about 2-to-1 between the HCA and LCA groups, while the differences in paper support was not quite so extreme.

Table 6

Differences in Production and Presentation Task-Factors as a Function of Computer Anxiety

	HCA		LCA	
Task-factor by support	Counts	%	Counts	%
P&P factor with human support	1248	79.5	1035	70.0
P&P factor with machine support	135	8.6	235	15.9
P&P factor with paper support	186	11.9	208	14.1
Totals	1569	100	1478	100

Summary

The vast majority of students said they desire personal support over other forms machine-based and paper-based support, but perceived scaffolding needs also vary across students depending on their computer anxiety and experience levels. The less anxious, or more experienced, and more confident students appear to prefer more sophisticated means for getting their support, such as computer-based or paper-based methods. There are of course a number of questions about, and explanations for this. One is that the more experienced students are less anxious *because* they are more experienced and believe they can get the help they need, when they need it. In addition, greater experience on the computer may make them feel more confident about overcoming a greater range of obstacles, knowing that they also have more options to suit their particular needs and ability levels. These options may include a greater circle of computer literate friends, a repertoire of troubleshooting skills that will enable them to solve problems, or successful experience finding special tutorials online as the need arise (just-in-time learning). To what degree do novice computer using students feel for example that they cannot understand the more sophisticated forms of support.

It is clear, that when they come up against difficult situations, computer anxious students will probably behave differently from their non-anxious counterparts, and that those (regardless of anxiety levels) with a greater repertoire of experience will have more options for support to choose from. Greater levels of computer experience are likely to give the student a greater appreciation of the potential uses of whichever specific technology they prefer and learn to understand; this alone may help reduce their anxiety about the technology itself and possibly give them greater confidence in perfecting and enhancing their related skills.

The student's pattern of behavior in times of trouble may vary just as much in intensity as they do by type of anxiety, that is whether the anxiety is about the computer itself, the self-evaluations they make about themselves in the social, or communication settings they find themselves in, or all of these.

Students' beliefs about the efficaciousness of various types of mediation of help may well vary depending on how much confidence they place in either interactive technology, printed materials, or other people to give them adequate information; or in their own ability to use technology to extricate themselves from problematic situations. Support information or intelligence can be designed to provided a multitude of ways to get help, mediated by humans or machines, but the question remains as to how students will choose to get their help, and when they get the help they choose, whether it will give them a boost in confidence.

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Appendix

Task List and Experience Response – Section A

These are:

1.Use word processing software such as Microsoft Word, Word Perfect, etc.
2.Subscribe to, and participate in a Listserv
3.Manipulate data, e.g., Excel, Access, Lotus 1,2,3, etc.
4.Use presentation software, e.g., Power Point, Photo Delux, Illustrator, or similar
5.Use design programs, e.g., Netscape Composer, Lotus Domino, Page Mill, Front Page, etc to create a web page
6. Use Email programs
7. Talk to others in an online chat room
8. Talk to others using an Internet telephone
9. Install and use a web cam on your computer
10.Download files from the Internet
11.Use drawing programs to create your own artwork
12.Browse and search the Internet for academic articles
13.Add a printer and the printer related software
14.Create folders, save, rename, and copy files on your computer
15.Download and install software to use streaming audio or video
16.Use threaded discussion data bases for academic group discussions
17.Use one of the instant messaging services
18.Install software on your computer
19.Use FTP to upload a file
20.Install a modem and its software
21.Use Boolean logic with an online search engine to find information on the web

TECHNOLOGY AND THE ENTRY-LEVEL EMPLOYEE: A SURVEY OF TECHNOLOGY USE AS DETERMINED BY ENTRY-LEVEL EMPLOYEES

Dr. Larry Honl, PHD
University of Wisconsin-Eau Claire

Mr. Keith Stearns, MAT
University of Wisconsin-Eau Claire

Mr. Se Hyung Oh, MBA Student
University of Wisconsin-Eau Claire

As the integration of technology becomes increasingly more important in business and education, the extent to which entry-level business people use technology needs to be explored. Assumptions are made by both employers and educators on the level of knowledge and application employees and students have with various technologies. Are employees able to use the technologies effectively in their day-to-day activities? Are there "best practices" employees need to apply when using business technologies as a communication tool?

This study attempted to determine entry-level employee's perceptions of their readiness for technology use, the future trends for technology in their careers, and their current training programs implemented in their business environments.

Background to the Study

Technology is a "buzzword" used daily in both business and education. Teachers and students are always looking for the latest improvements in computers, peripheral equipment, and software. But are the users of these technologies comfortable in how these devices should be used as a communication tool? Are we using a videoconference appropriately and effectively? Are there appropriate guidelines one needs to follow when faxing information? Does an Internet Video Conference follow the appropriate protocol? Are we using email as a communication tool effectively?

According to Andy Marken, president of Marken Communications, who cites a recent issue of *Business Week*, 10,000 new Web sites are added to the Internet daily. Technology and the Internet have "forced" management, as well as marketing and support people, to broaden their knowledge areas. It has forced people to deal in a rapidly changing environment of uncertainty (Marken, 2001).

Forrester Research and John Carroll University completed a study that identified the following:

> A trillion e-mail messages are sent worldwide annually; 3 billion e-mail messages are sent worldwide daily; 150 million users send e-mail daily; people spend an average of 50 minutes reading e-mail everyday; and each person averages 60 minutes responding to e-mail messages everyday (Marken, 2001).

These changes and trends, which will continue to evolve and transform how we communicate and live, provide a number of new opportunities for communication training and the need for training on the job or in an educational setting.

Another area where employees will need assistance is in learning how to communicate in mediated environments. Electronic mail, voice mail, and teleconferencing have the ability to alter how we interact with others.

Training in the United States is a big business. Estimates range from $200 to $210 billion spent annually on employee training. Over one million people make their living working with the training needs of organizations. Communication is the number one area where training is delivered along with leadership skills, the second most popular content area (Winsor, 1997).

The educational system is involved with technology training at various levels. What courses are students taking at post-secondary schools that relate to business technology? Are there stand-along courses that specifically teach how to use technology as a communication tool? Checking schools throughout the United States, very few of these schools offer a specific course on communicating via business technology. Courses such as Business Technology with an emphasis on Excel are common along with Office Technology, Document Processing, Office Systems Software, and Desktop Publishing at the post-secondary level.

A course called "Communication Technology" at St. Paul College offers a hands-on instruction in current telecommunications technology. The study will apply their knowledge of various communication devices by completing several projects. Communication technology such as internet, reprographics, e-mail, scanning devices, multimedia, voice recognition, and fax transmission will be used in this course.

Another course at Pasadena City College offers a course in Internet/Office Communication Technology. This course helps students use the features of office communication technologies including the use of the internet for business research, telephone systems, voice mail, e-mail document and package mail systems facsimile, duplicating systems, and teleconferencing. This particular course has two hours of lecture and one hour of lab.

Sinclair community college offers a course in telecommunication technologies. Students are exposed to voice mail, fax machines, cell phones, pagers, multifunction devices, etc.

EQUIPMENT/TECHNOLOGY USAGE AND NEED

The International Association of Administrative Professionals conducted a survey in 2002 of its members to determine what major issues faced their profession. Management and Technical Training was found to be the most significant issue facing its profession. Almost 7 out of 10 respondents indicated the need for management and technical training (71 and 66 percent, respectively). The specific areas that the respondents identified as a need for training included computer specific software, technology applications, and communication skills (Employers . . ., 2003).

Headlines in many business publications and trade journals indicate dramatic changes ahead that will transform the way employees and supervisors will do business. The years ahead will be challenging for both groups to stay relevant and employable when the old rules and the old ways don't work anymore.

Technology will continue to eliminate old jobs and create new ones at a record pace. Employees will have to stay current with technology—not just computers, but with other key technologies. The three basic ingredients for continued employability are technology training, technology training, and more technology training.

FUTURE TRENDS

Video conferencing is seeing positive results as a tool to ensure a consistent training message and to reach a dispersed workforce. A 280-employee financial services firm in Seattle installed video conferencing equipment throughout the company. The company now simulcasts to all their offices, reaching all the staff. Management feels this approach has improved delivery consistency and inter-office communication (How Training . . ., 2002).

Purpose Statement

The purpose of this study is to determine what technologies entry-level employees use in their jobs and the preparation they have received on these technologies.

Scope Statement

This study will focus on employee's perceptions of readiness for future technology use, future trends for technology use in business, current training programs implemented in business, and future trends in the technology area. The study will not identify specific practices employees use in communicating via these technologies.

Definition of Terms

Video Conference: Conducting a conference between two or more participants at different sites by using computer networks to transmit audio and video data.

Teleconference: To hold a conference via a telephone or network connection.

Internet/Network Telephony: A category of hardware and software that enables people to use the Internet as the transmission medium for telephone calls.

PDA/Pocket PC: Short for personal digital assistant, a handheld device that combines computing, telephone/fax, and networking features.

Voice Recognition: The field of computer science that deals with designing computer systems that can recognize spoken words.

Blackberry: A line of mobile e-mail devices and services from Research in Motion (RIM).
Source: **http://webopedia.lycos.com**

Methodology

This study was completed by surveying recent business graduates to determine what technologies are currently being used at their company. A questionnaire was developed by the authors and then juried to other communication instructors to determine areas of concern in clarity, content, and organization. The questionnaires were coded to determine specific employment locations in order to conduct a follow-up to the appropriate people.

The instrument was refined and then sent to 700 entry-level employees. A return of 24 percent was received on the initial mailing. A second mailing was completed and sent to the non-responders of our initial mailing. The total return for the two mailing was 34 percent.

The questionnaire was then coded in SPSS under demographic information (year graduated, company, major, and minor); equipment/technology usage; training information; and future trends.

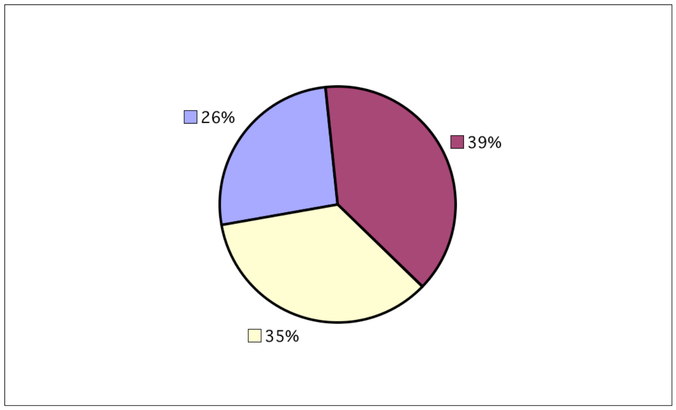
FINDINGS

This section will discuss what equipment/technology employees are using, how much training they have received on this equipment, and what is the future of equipment/technology at their firm. This section will also identify demographic information that was collected involving year graduated, company worked for, and academic major.

Demographic Information

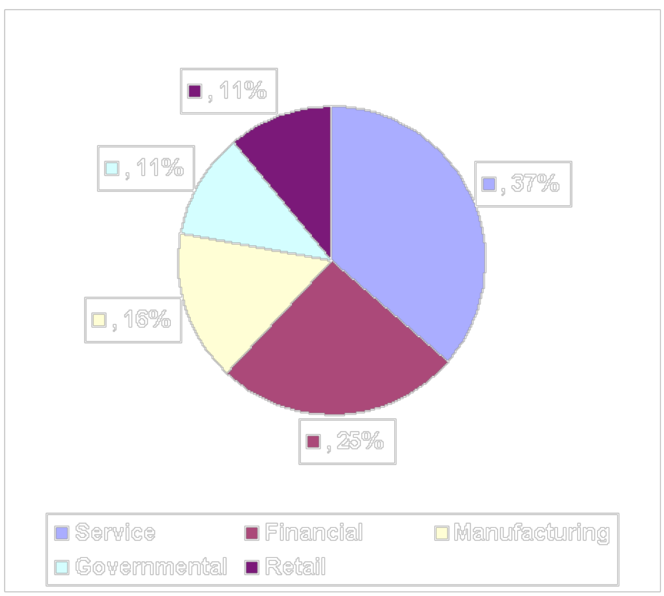
Students that had graduated in the last three years were identified as appropriate for giving the needed information on their use of technology in their business environments. As can be seen in Graph 1, the respondents were quite even for the three graduation years.

Graph 1
GRADUATION YEAR OF RESPONDENTS



Another area that was needed to help direct the results of this study dealt with where the employee was working. Graph 2 displays the area of employment for respondents to the survey.

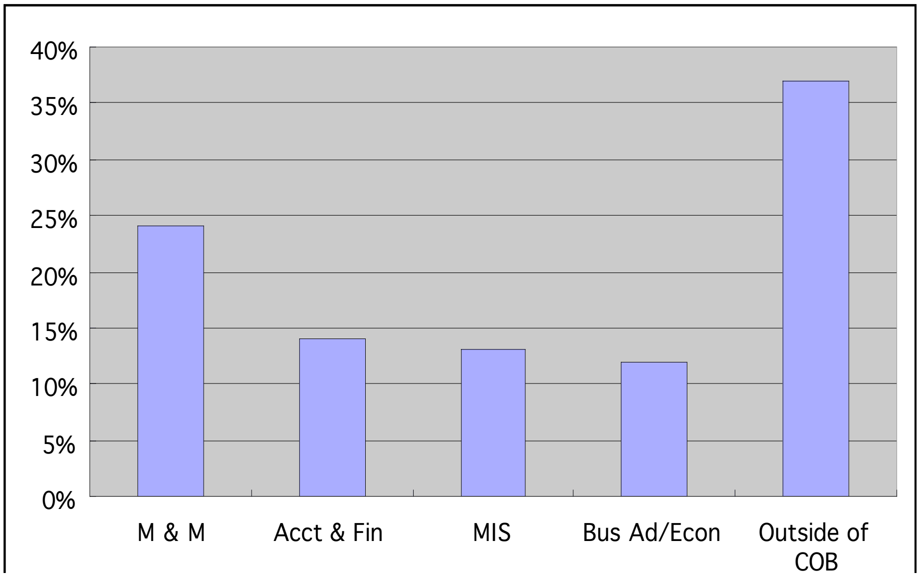
Graph 2
TYPE OF COMPANY EMPLOYED



The type of major was another area that was needed to determine differences by functional areas in business. The majority of respondents were in the Marketing and management area along with the Accounting/Finance area as can bee seen in Graph 3.

Graph 3

MAJOR OF RESPONDENTS



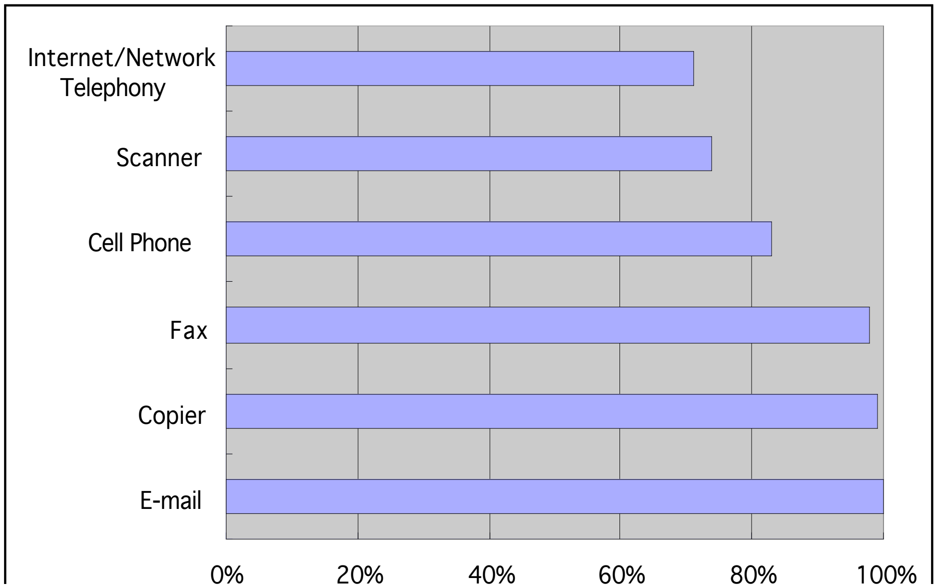
EQUIPMENT/TECHNOLOGY USAGE

What equipment and technology are the employees using in the day-to-day activities? Perceptions of equipment and technology usage were explored in the following areas:

- ☐ FAX
- ☐ Scanner
- ☐ Video Conference
- ☐ Internet Video Conference
- ☐ Teleconference
- ☐ Internet/Network Telephony
- ☐ Cell Phone
- ☐ E-mail
- ☐ PDA/Pocket PC
- ☐ Projection Unit (VDP)
- ☐ Group Conferencing
- ☐ Voice Recognition
- ☐ Digital Camera
- ☐ Camcorder
- ☐ Beeper
- ☐ Blackberry
- ☐ Copy Machine
- ☐ Other: Please identify. _______________ ___________________________________

This question showed that email, copier, and fax were being heavily used by our graduates. The Internet/Network telephony was also a new technology being used by these new graduates. Graph 4 shows the top six technologies being used.

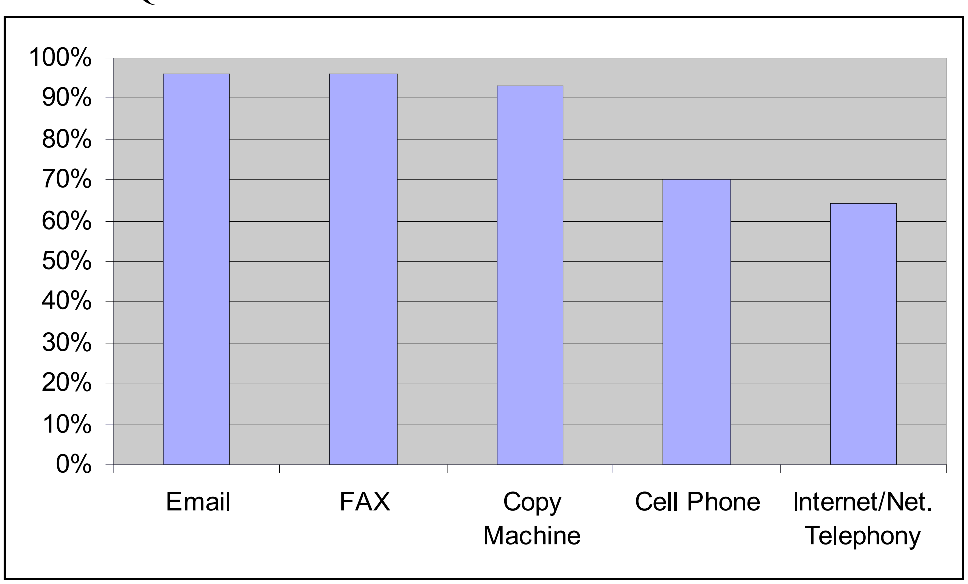
Graph 4
TECHNOLOGY USED BY GRADUATES



EQUIPMENT/TECHNOLOGY ACCESS

Another question dealt with the equipment/technology that each employee has access to in their place of employment. Again, respondents were asked to "check all that apply" in a list of 17 items. Email, FAX, and the Copy Machine were the top items.

Graph 5
EQUIPMENT/TECHNOLOGY EMPLOYEE ACCESS



The employees were asked about their access to technology equipment. Access to equipment and technology based upon three criteria was also explored:

- Individual access-equipment/technology which has been assigned to you for exclusive use.
- Departmental access-equipment/technology which is available to department staff on a check-out or other basis.
- Company-wide access- equipment/technology which is available to company staff on a check-out or other basis.

Table 1 identifies the top six responses of the 17 items.

Table 1
ACCESS TO TECHNOLOGY/EQUIPMENT

EQUIPMENT	**INDIVIDUAL ACCESS**	**DEPARTMENTAL ACCESS**	**COMPANY-WIDE ACCESS**
E-mail	73	30	44
Copy Machine	27	55	55
FAX	21	63	53
Internet video conference	6	8	14
Scanner	16	41	35
Cell Phone	50	21	20

Table 2 identifies the remaining responses given by employees regarding their access to technology equipment. Teleconferencing, video conferencing, and the digital camera were key areas also identified as high access for the respondents.

Table 2
SECONDARY LEVEL OF ACCESS TO TECHNOLOGY EQUIPMENT

EQUIPMENT	INDIVIDUAL ACCESS	DEPARTMENTAL ACCESS	COMPANY-WIDE ACCESS
Teleconference	17	30	38
Digital Camera	14	34	27
Projection Unit (VDP)	7	28	30
Video Conference	6	18	30
Group Conferencing	8	19	25
Beeper	21	14	16
Camcorder	7	17	26
PDA/Pocket PC	23	10	9
Voice Recognition	4	4	4
Blackberry	2	1	1

PERCEPTIONS OF SKILL LEVEL

Perceptions of skill level among alumni were explored in three areas:

- Proficient (Pro)-can use some advanced features; never need assistance with basic functions
- Intermediate (Int)-can use basic functions without assistance
- Beginner(Beg)- occasionally need help for use of basic functions

The following three charts show the access level and skill level of participants for each equipment/technology. The access level is shown in parentheses, which is right next to the name of equipment. There are three skill levels which are proficient, intermediate, and beginner. Since the skill level of intermediate and above is adequate to work with equipment/technology, a "*Proficient + Intermediate %*" column was added. It displays the number of respondents that have adequate skills to effectively work with listed equipment/technologies. These charts are separated by the level of access from high to low.

Table 3
PERSONAL ACCESS AND SKILL: ITEMS WITH HIGH ACCESS

	Proficient	Intermediate	Beginner	(Proficient+Intermediate)%
Fax (96%)	75%	20%	1%	95%
Email (96%)	87%	8%	0%	95%
Copy Machine (93%)	74%	20%	1%	94%
Cell Phone (70%)	66%	11%	0%	77%

Table 4
PERSONAL ACCESS AND SKILL: ITEMS WITH MODERATE ACCESS

	Proficient	Intermediate	Beginner	(Proficient+Intermediate)%
Scanner (56%)	22%	26%	24%	48%
Teleconference (53%)	13%	22%	18%	35%
Digital Camera (48%)	16%	27%	13%	43%
Projection Unit (38%)	9%	22%	17%	31%

Table 5
PERSONAL ACCESS AND SKILL: ITEMS WITH LOW ACCESS

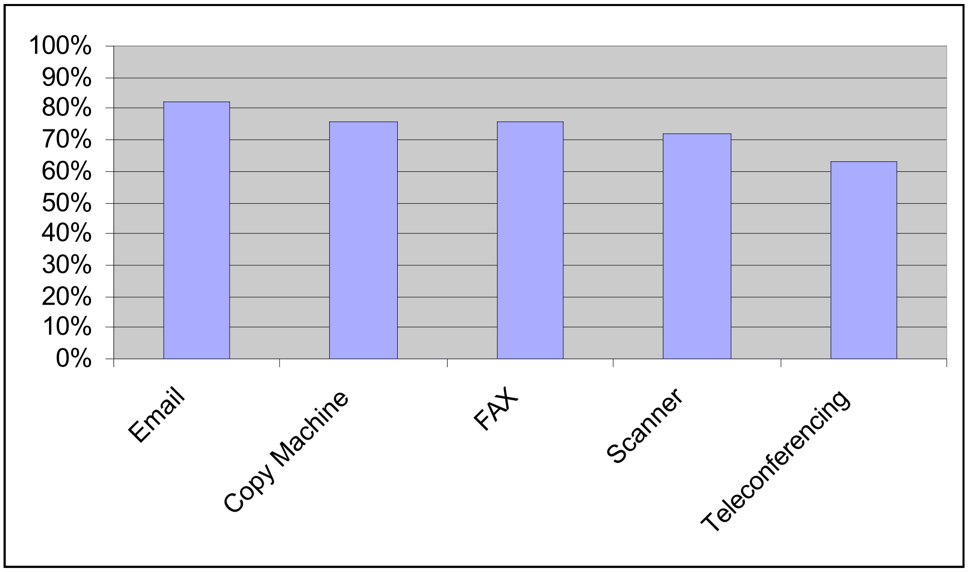
	Proficient	Intermediate	Beginner	(Proficient+Intermediate)%
PDA/ Pocket Pc (28%)	16%	11%	12%	27%
Camcorder (27%)	15%	20%	6%	35%
Group Conferencing (27%)	6%	9%	14%	15%
Video Conference (25%)	2%	9%	22%	11%
Beeper (24%)	22%	11%	5%	33%
Voice Recognition (5.4%)	1%	2%	9%	3%

As displayed in the tables above, the skill level of each equipment/technology almost matches its access level. For example, when the access level of certain equipment is high for employees, the perceived skill level of employees for that equipment is high and vice versa.

FUTURE TRENDS

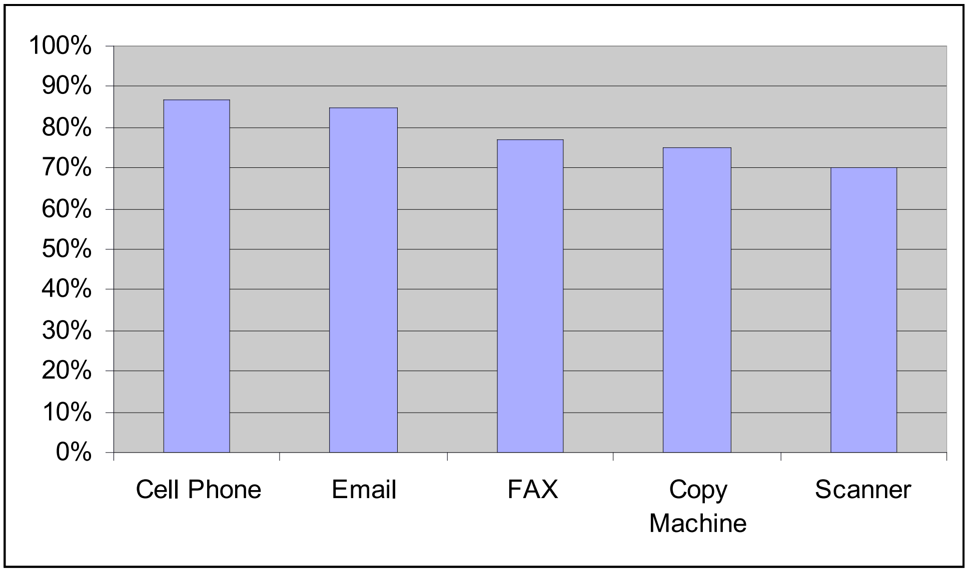
What equipment/technologies do you see co-workers using in the next five years? This question was asked to see the future trends that educators and business trainers need to be aware of based on perceptions of employees today. Graph 6 shows that respondents believe that many technologies will be used at greater levels than they are presently being used today.

Graph 6
TECHNOLOGY BEING USED BY CO-WORKERS IN THE NEXT FIVE YEARS



What technologies these employees will be using in the next five years was also of interest to the writers. E-mail, fax, copy machine and Cell phones were again identified as technologies that the employees thought they personally would be using in the next five years. Graph 7 identifies the planned use for these technologies.

Graph 7
TECHNOLOGIES TO BE USED BY EMPLOYEE IN THE NEXT FIVE YEARS



Conclusions

After reviewing the findings of this study, the following conclusions were made:

1. Young employees are using email, copiers, and faxes very heavily in their day-to-day operations.

2. Email, copiers, and faxes along with cell phone and Internet/network telephony are easily accessible to our graduates in their employment environments.

3. Young employees feel they have little proficiency in using video conferences, utilizing voice recognition and working with group conferencing.

4. Teleconferencing is predicted to be used much more in five years as compared to its present use by entry-level employees.

5. Blackberry, group and video conferencing, and PDA usage will continue to increase as identified by entry-level employees.

Recommendations

After reviewing the findings of this study, the following conclusions can be made:

1. Educators and employers need to make technologies accessible as employees have a direct positive correlation between access and perceived proficiency.

2. Business and education trainers should focus on providing instruction on using teleconferencing for future classes.

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Computer Technology for Reading Instruction

Sharon Hsiao-Shan Huang
University of North Texas

Introduction

Reading is very important for students' learning in every subject; it assists students for almost all future learning and is important in their daily lives. Computer technology can save teachers' time for remedial instruction, and it also increases students' motivation for reading. There are many research studies that suggest interactive multimedia computer software is a positive approach to reading instruction (Blok, Oostdam, Otter, & Overmaat, 2002).

This paper examines the effects of computer applications in reading instruction as well as types of computer technologies that can be used in reading instruction and provides teachers with ways to implement computer technology into their reading classes. The paper also lists some reading and literacy web sites that serve as resources for teachers.

Effectiveness of Computer Application in Reading Instruction

Since the computer usage for students is high, teachers can take advantage of the Internet and interactive multimedia computer programs to help students improve their reading skills.

The Stanford Project, conducted by Atkinson & Hansen (1966), was one of the first documented attempts of computer-assisted instruction (CAI) program in initial reading. The

system was completely computer-monitored and minimized the role of the reading teacher. The computer program selected exercises based on the students' earlier scores. Students progressed at their own pace through a set of materials designed to fit particular abilities. Several years later, the results were published on an evaluation of the Stanford CAI program in initial reading (Fletcher & Atkinson, 1972). The evaluation showed that the program supplemented the teacher's reading instruction on a regular basis: eight to ten minutes of CAI per day. The results showed that CAI students achieved higher reading scores when compared with students instructed by teachers.

Blok, Oostdam, Otter, & Overmaat, (2002) reviewed 42 studies published from 1990 about the effectiveness of computer-assisted instruction (CAI) programs in supporting beginning readers. This study comprised a total of 75 experimental comparisons. They indicated that interactive multimedia CAI programs can support beginning reading instruction. The interactive multimedia CAI programs provide the advantage of instant feedback, which is not threatening to students.

Torgesen and Horen (1992) also did a research focused on students who delayed in the acquisition of decoding skills. They distinguished CAI training into three types: (1) phonological awareness training, (2) context-free practice in word reading, and (3) reading practice in context. They concluded "substantial progress has been made in developing the microcomputer as a useful tool in reading instruction for learning-disabled children"

(Torgesen and Horen, 1992, p.177).

Balajthy (1995) studied using computer technology to aid disabled readers. He indicated that interactive multimedia computer programs provide the audio and visual effects to enhance the comprehension of students, which makes the technology an important development for literacy education. The increased use of voice synthesis has revolutionized computer-based word recognition software; the text to speech technology sounds out for students. One of the most useful devices for young children and their emerging literacy is an alphabetic keyboard in which letters are displayed in alphabetic order; this increases the familiarity of both the keyboard and the alphabets. Another important type of emergent literacy software is language experience approach story creation software. For example, many high-interest software simulations involve students in large amounts of time-on-task active reading. The general finding has been that CAI programs in initial reading instruction should be used only to supplement, not to supplant, the human teacher (Balajthy, 1995).

Wise and Olson's review (1998) evaluated the efficacy of "talking" computers in combination with phonological awareness training; they reviewed studies published between 1990 and 1995. Their review concerns mainly children with reading disabilities. The general conclusion is that trained students profited from the intervention of multimedia computers. However, it also emerged that stronger students averaged greater gains than

students with low phonemic awareness.

The U.S. National Reading Panel (NRP) report contains a chapter on computer technology and reading instruction (National Institute of Child Health and Human Development, 2000). The chapter offers a review of 21 studies published between 1986 and 1996. The NRP review includes vocabulary, reading comprehension, and writing from kindergarten until high school. They concluded "All the studies in the analysis report positive results for reading remediation" (National Institute of Child Health and Human Development, 2000, ch. 6, p. 2). The NRP authors also consider the talking computer a promising alternative tool for reading instruction. The addition of speech to print can enhance the learning of phonics as well as the comprehension of stories and help students connect the sound with text.

Incorporating Computers to Support Reading Instruction

Heese (1997) listed many ways to incorporate interactive computers in reading instruction. Teachers do not need many computer skills to apply them. Based on my teaching experience, I generated some ideas of incorporating computers to reading instruction for teachers as below.

1. Interactive multimedia CD-titles

The interactive multimedia CD-title (sometimes also called "electronic book", "interactive text", or “talking book”) is an exciting development in literacy education

(Balajthy, 1995). Students can play the interactive multimedia CD or titles they wish to read and interact with the computer. One example is "Living Books" by Broderbund. Students click on the text or the pictures to listen to the text again or watch an animation/video expressing the text for them. Students get better understanding of the text and story by clicking anywhere on the screen that they want to explore more. This can be a very joyful and interactive experience for students.

2. Visit a reading web site

Teachers can put some children's reading web sites as favorites settings of browsers on classroom computers. This way, students and teachers can access the sites easily. Some authors who write children's books have their own web sites. Students can get more acquainted with the authors they like by visiting these web sites. They might find many more interesting books they want to read from the authors they admire. A collection of sites for children's reading literacy is listed in the appendix.

3. CAI that connects reading and writing

There is some interactive multimedia software such as the "Rhyme Writer" from Jostens Learning Corporation that connects reading and writing. This software allows students to write their own poems or chose from the menu to create their own poems. Computer writing software can provide guidance for writers in terms of topic and structure, offering a framework to support writing (Balajthy, 1995). The computer writing software guides

students from analyzing the topic, making an outline, and structuring the paragraphs to offer choices of ideas for writing. This provides a framework and supports beginning writers.

4. Reading projects

Teachers can help older students research on the Internet and find some multimedia clips and information about a reading subject. Then, teachers can support students' efforts to put together a multimedia website or presentation. Students who are involved in creating multimedia projects for a reading topic can increase their interest and achievement in reading literacy (Balajthy, 1995).

PowerPoint multimedia presentation reading projects also provide students a good way to establish language fluency. Teachers can choose some stories to be rewritten into PowerPoint by students with the teacher's help. Then students can record their voice into the presentations and make them multimedia e-book authored by the students. I found the microphone plays an important motivational role for students to record/read the stories again and again. This way, students can improve their language fluency.

5. E-Books from E-Library

Teachers can guide students to register for E-library accounts and check out E-books. Students who have Internet access at home can read the E-books at home, too. Research shows that teachers have more positive attitudes toward computers if they have computer access at home, and their attitudes influence their students' attitudes (Christensen & Knezek,

2003). If teachers have training and access to the computer, their students tend to use computers more often.

6. Drill and practice software

Drill and practice software is easy to create and popular with schools (Balajthy, 1995). Balajthy indicated that students could take advantage of spelling and grammar drills and practices to reinforce learning. However, the design of the practice and drill should be considered carefully. Practice bores students if it is not well designed. A game-like design can make the drill more interesting and less instruction-like.

7. Evaluation of reading

The Accelerated Reader (AR) program is widely used in elementary schools to increase reading competency among students. However, the effectiveness of this program is quite debatable.

Topping & Sanders (2000) indicated that AR increases students' usage of the library and increases students' achievement scores on reading tests along with helping students increase their reading comprehension. However, researchers debate whether AR helps teachers turn their students into readers (Chenoweth, 2001). Extrinsic motivators, particularly tangible rewards such as those suggested by AR, can reduce internal motivations to read (Cameron & Pierce, 1994; Gambrell & Marinak, 1997; Sweet, 1997). Studies have shown that students become dependent on the rewards for their motivation, need more prodding to read and read

less frequently when the reward is discontinued.

Carter (1996) debated that AR is preventing students from getting the real joy of reading. This might be an issue for teachers to notice when they apply the rewards for students' AR tests. If students focus too much on the rewards that they earn from the AR points, it might take away the real joy for reading.

Taking into consideration Carter's opinion, further studies could identify the AR as a computer evaluation tool only, and take away the reward system. There might be some different findings.

Trends in Research

The U.S. National Reading Panel (NRP) reported some trends for researchers from their study. These trends include the potential benefits of computers in reading for (1) word processing, (2) use of computers as motivational device, (3) use of computers as assisting technologies for special populations, and (4) the potential of hypertext as an alternative medium for reading and studying (National Institute of Child Health and Human Development, 2000).

Word processing software can benefit reading instruction in spelling and writing, too. Teachers can also use email to have discussions of books among students. Pen pals from other schools, states, or countries can also help students with language and culture sharing. Pen pals can communicate through Internet chat rooms or email.

The use of computer technologies as motivational agents is very popular even for parents at home. There might be some novelty effects evolved in the motivational effects; it is possible that as computers become more familiar to students, their motivational value will diminish. But as long as students love computer games, reading instruction can still make good use of the motivational aspects of computers and software.

The third trend of studies is the use of computers as assisting technologies for special populations, and it may point the way for the future. Will some population benefits from computers more than other population? There seems to have been less resistance to the adoption of computer technologies for those populations with limited reading capabilities than for mainstream populations. Gender and age issues can be further studied in the future for the interaction effects of computer technology and reading instruction to find out if there are differences between male and female students of certain ages for their adaptation to computer technology.

The fourth trend that NRP pointed out is the potentially important applications revolving around hypertext and hypermedia. Hypertext and hypermedia allow students to click on the links and navigate through the content with their own control. This kind of network-like navigation may also involve developing new modes of instruction for students to use them effectively. Most exciting about this trend is that it represents truly new ways of applying computer technology to reading and reading instruction, because it allows students to jump at

anytime to anywhere.

Conclusion

Without a doubt, reading is a fundamentally important subject for all students. Reading capability influences not only students' academic leaning but also their self-esteem and daily lives. However, the reading level of some students is below the grade level (Nemitz, 2003), and a revolution of reading instruction should take place now. The multimedia computer technology should play an important role for the reading instruction.

This paper examined the studies about the effects of computer applications in reading instruction, trends in research in this field, and provides teachers ways of implementing computers into their reading instruction. Lists of some reading and literacy sites as supplements to teachers are also provided.

Although Carter (1996) had different opinions about computers in evaluating and motivating students reading in Accelerated Reader & Electronic Bookshelf programs, the effects of computer tools as reinforcing reading comprehension are still valuable. However, teachers might want to take Carter's arguments into consideration and apply the software to their reading instruction without the reward system.

Limited research exists concerning multimedia computer programs in reading instructions and assessments. Further research to analyze the assessment tool programs is suggested to evaluate only its effects as a computer evaluation tool without the rewarding

system.

The rapid development of capabilities of computer technology, particularly in speech recognition and interactive multimedia presentations, promises even more successful applications in literacy for the future.

However, compared to the amount of research studies of reading, relatively little research has been conducted in this important area, and consequently, many unanswered questions remain. It is important that research be initiated to answer the questions and be certain that the computer technology is incorporated in instruction as efficiently as possible.

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Appendix

List of reading sites:

Act!vated folktales for reading out loud, http://www.activated-storytellers.com/folktale.html
ALA Book Links, http://www.ala.org/BookLinks/
America Reads Challenge, http://www.ed.gov/inits/americareads/index.html
Between the Lions, http://www.pbskids.org/lions
Book It, http://www.bookitcanada.com/
Children's Literature Web Guide, http://www.acs.ucalgary.ca/~dkbrown/index.html
Children's Writings, http://www.ucalgary.ca/~dkbrown/writings.html
Classroom Literacy, http://www.discover.tased.edu.au/literacy
Compact for Reading, http://www.ed.gov/pubs/CompactforReading/

Clifford's Interactive Storybooks, http://teacher.scholastic.com/clifford1/
ERIC Reading, English, and Communication, http://www.indiana.edu/~eric_rec/
Folk and Fairy Tales, http://www.pitt.edu/~dash/folklinks.html
Ika's Stories, http://www.ika.com/stories/
Interactive Stories, http://wvu.org/interactive-stories.shtml
Kidsnewsroom , http://www.kidsnewsroom.com/
Linda's Poetry, http://www.cpinternet.com/~snorrig/lindag/index2.htm
Literacy Empowerment Foundation (LEF), http://www.literacyempowerment.org/
National Council of Teachers of English (NCTE), http://www.ncte.org/
National Reading Conference (NRC), http://www.oakland.edu/~mceneane/nrc/nrcindex.html
National Academy Press, http://www.nap.edu/
Ohio Reads, http://www.ohioreads.org/
Online Children's Stories, http://www.ucalgary.ca/~dkbrown/stories.html
Poetry for Kids, http://www.nesbitt.com/poetry/
Read California, http://www.readcalifornia.org/
Reading On-line Journal, http://www.readingonline.org/
Sensational Strategies for Teaching Beginning Readers, http://www.ortongillingham.com/
State Literacy Resource Centers, http://www.ed.gov/Programs/bastmp/SLRC.htm
Story Hour at the Internet Public Library, http://www.ipl.org/youth/StoryHour/
Student Coalition for Action in Literacy Education (SCALE), http://www.unc.edu/depts/scale/
Success for All, http://www.successforall.net/
The Adventures of Banph, http://www.banph.com/
The Knowledge Loom, http://knowledgeloom.org/
The Moonlit Road, http://www.themoonlitroad.com/
The Official Eric Carle Web Site, http://www.eric-carle.com/
Time for Kids, http://www.timeforkids.com/TFK/

A Constructivist Approach to Interactivity and Feedback in Computer Enriched Instruction

Jason Huett, Teaching Fellow
University of North Texas
Department of Technology and Cognition
P.O. Box 311337
Denton, Texas, 76203
Office: 940-565-4238
FAX: 940-565-2185
jasonhuett@charter.net

Abstract

There is a growing understanding that today's students cannot be effectively mass-produced and constructivism, with its emphasis on education as a *process* and not a product, is now headed for the mainstream. This poses some unique challenges for the distance learning environment. Applying constructivist thought to computer enriched instruction is no easy task. This article will focus on differentiating between constructivist ideals and the current factory model of education. The history of constructivist thought will be briefly examined as well as parallels between constructivist movements in Psychology and Education. The four tenets of constructivism, as outlined my noted psychologist Michael Mahoney, and how they can be applied to the design principles of interactivity and feedback for web-based and locally-delivered computer assisted instruction will also be discussed.

Introduction

> School cannot be a place of pleasure, with all the freedom that would imply. School is a factory, and we need to know which workers are up to snuff . . .The teachers in charge are the floor bosses, so don't expect them to praise the virtues of free intellectual

> development when everything, absolutely everything in the school setting - the classes, grades, exams, scales, levels, orientations, streams - enforces the competitive nature of the institution… (Pennac, 1994, p.92)

Understanding constructivism and how it can be applied to Computer Assisted Instruction (CAI), or perhaps more aptly named Computer Enriched Instruction (CEI), requires acknowledgment that, for the large part, the current educational system follows a factory model. For its time, this model was not without merit. The factory model of education was born out of the industrialization period of the early 1900's. The model also reflects agrarian concerns— such as children's need for summers off to help sow and harvest fields. However, our understanding of human development and the way we learn has taken significant leaps in the last 100 years. Yet, the educational model is still controlled by turn-of-the-century policy based on a societal model that no longer exists or applies (Pond, 2000). Unfortunately, this model primarily concerns itself with the regurgitation of inert knowledge (Pond, 2000). Like cars on an assembly line, students move from class to class. The expectation is that, at the end of the day, all of this passively absorbed knowledge by the product (read student) will produce an individual adequate at the task of being a *product*ive, learned citizen.

Ironically, most schools (if you go by what is written on their mission statements) claim to be churning out independent thinkers, who are life-long learners, industrious and innovative team players, and who are actively involved with the community. All of this is supposedly accomplished by following an inadequate and outdated structure. Today's teacher has, in effect, become the floor manager in charge of the assembly of uniform widgets. Over 100 years ago, uniformity may have been a necessary model. Currently, that model does little to address emerging learning theories and styles.

With a growing understanding that today's students cannot be effectively mass-produced, constructivism, with its emphasis on education as a *process* and not a product, is now headed for the mainstream. Mahoney (1996) points out that during a literature review for psychology he could not find any uses of the "constructivi" stem (constructivism, constructivist, etc.) in surveyed literature in 1974.

However, by 1994 the frequency had increased substantially. By 2003, one finds it ever more present. The arena of education reflects this change as well. One need only search the National Education Agency's (NEA) website and find advocates of constructivism and links to constructivist sites outlining how it can and should be used in the modern classroom.

This article first reviews the literature underlying the constructivist movement paying particular attention to the tenets of constructivism as outlined by noted psychologist Dr. Michael Mahoney and examines how Mahoney's ideas, and those of his peers in the field of constructivist research, can be applied to design principles for interactivity and feedback in Computer Enriched Instruction (CEI). Then general guidelines for creating constructivist CEI are presented.

Background

According to Mahoney, constructivism is neither a new concept nor a narrow one. One can trace its roots as far back as the teachings of Lao Tzu and, later, to the teachings of Giambattista Vico (Mahoney, 2003). In recent times, the constructivist movement in psychology and education has seen an increase in popularity. It has a growing acceptance as a potentially viable alternative to the current, dominant, educational model. It is incumbent upon educators to examine the relationship between constructivism and emerging learning theory. With the immense power and potential of computers in education, it becomes doubly important to examine how constructivist epistemology can be applied to CEI. Without such exploration, CEI runs the risk of "falling into the academic pit that is filled with so many other panaceas for learning" (Jonassen, 1993, section 1.0).

Traditional education and CEI are primarily concerned with the relationship between the learner and the material to be learned. Well-designed feedback and interaction in constructivist CEI should concern itself with creating a dialogue or conversation. This dialogue is based on constructivist principles that take advantage of the social contexts of learning, extensive interaction with others, and the higher level application of this knowledge (Dewey, 1916). This requires feedback and interaction models that cater to delayed or, preferably, real-time, interaction between members of the environment such as chats, and video and audio conferencing.

The Five Basic Themes of Constructivism

Constructivism can be defined as a theory of learning and knowing that holds that learning is an active process of knowledge construction. Learners build on prior knowledge and experience to shape meaning and construct new knowledge(Lambert & Walker, 1995). Mahoney (2003) points to five basic themes underlying the understanding of the tenets of constructivism: (a) Active Agency, (b) Order, (c) Self, (d) Social-Symbolic Relatedness, and (e) Lifespan Development.

Mahoney addresses constructivism within the context of psychology and philosophy. For educational purposes, constructivist theories and their implications need to be understood on both a philosophical and a psychological level. Otherwise, effective interactive media cannot be designed for the target audience.

In order to develop effective CEI based on constructivist paradigms, one needs to understand the essence of constructivism. That is how constructivism facilitates knowing and how this understanding can lead to more effective learning. Of the five basic themes, *Active Agency, Order, Self,* and *Social-Symbolic Relatedness* deserve closer examination in the context of interactivity and feedback in CEI.

Active Agency

Every individual is an active participant in his or her life own life. Humans "are not passive pawns in the game of life…the individual is an active agent in the process of experiencing" (Mahoney, 2003, p. 5). In terms of the learning environment, constructivists believe each individual structures his or her own meaning (Jonassen, 1993). From a CEI design standpoint, the computer environment should cater to individuals who are "required to examine thinking and learning processes; collect, record and analyze data; formulate and test hypotheses, reflect on previous understandings; and construct their own meaning" (Parker, 1997, p. 7). There can be no interactivity unless the environment meaningfully engages the learner (Hannon and Adkins, 2002). This is achieved by creating CEI that provides for activities which learners find meaningful within an interactive context that allows for adaptive responses and immersion in the media.

Designing constructive interactivity and feedback for CEI is no easy task (Shneiderman, 1998). To design CEI that incorporates constructivist principles for feedback and interaction, one must understand that learning occurs

within a context that is often prone to tangents. Feedback must go beyond objective right or wrong answers or "little more than mouse clicks and generalized, repetitive, non-adaptive feedback" (Sims, 2000, p. 46). The CEI designer must allow for a discussion model where feedback can be immediate, spontaneous, or delayed to allow for greater depth of learning (Klassen, Vogel, & Moody, 2001). Constructivist theory also gives emphasis to the concept of *feedforward*. That is using the brain's anticipatory mechanisms to enhance learning and to make connections (Mahoney, 1991). Jonassen (1993) describes how the learner needs to move in meaningful phases. In effective constructivist CEI, the individual is given the freedom to create meaning: "Significant learning occurs when learners establish connections between presented content and individual prior knowledge, and transfer it to new and relevant situations" (Moller, 1998, p. 117).

Order

Numerous studies have shown that each individual creates personal patterns and habits often on a subconscious level (Dewey, 1922). For Mahoney (2003), "Much human activity is devoted to the ordering processes—the organizational patterning of experience; these ordering processes are fundamentally emotional, tacit, and categorical, and they are the essence of meaning making" (p.5). If every individual creates personalized patterns of order, it follows that each individual learns differently from the next. No two individuals are going to bring the same experience base to the class or structure the information presented in the same way. Current CEI educational design models tend to follow a linear process that adopts a one-size-fits-all approach (Wilson, Jonassen, Cole, 1993). To engage the learner in a constructivist platform, the interactivity and feedback has to respect each individual's sense of order. For Hannon and Atkins (2002) a sense of order or control is one of three conditions that have to be met for the learning environment to be considered constructively interactive.

Lynch paraphrases suggestions from Remington and Gruba concerning the challenge of acknowledging each individual's organizational patterning of experience when designing interactivity and feedback models. In order to design an effective learning environment, instructors must:

- Resist taking control of student activities when they appear to be going astray.

- Become learning facilitators rather than knowledge transfer controllers.
- Do not underestimate the effects of peer pressure.
- Re-evaluate the grading system to allow higher marks for students who improve their work on the basis of earlier feedback, or to formally negotiate marks with students (Lynch, 1998, ¶ 11).

Each of these suggestions takes into account that interactivity and feedback, from a constructivist perspective, need to acknowledge each individual's sense of personal order by making the CEI environment as learner controlled as possible. One can also see the inherent difficulty in applying such suggestions to CEI or other forms of distributed education.

Self

Mahoney (2003) contends that before we can organize our world we have to organize ourselves. This is not a new concept and hearkens back to Piaget's stages of development:

> In Piaget's view, intelligence consists of two interrelated processes, organization and adaptation. People organize their thoughts so that they make sense, separating the more important thoughts from the less important ones as well as connecting one idea to another. At the same time, people adapt their thinking to include new ideas, as new experiences provide additional information. This adaptation occurs in two ways, through assimilation and accommodation. In the former process, new information is simply added to the cognitive organization already there. In the latter, the intellectual organization has to change somewhat to adjust to the new idea. (Berger, 1978, p.55)

Each individual's self is unique: "Moreover, what people experience is integrally related to how they have learned to create an orderly reference point— a metaphorical center" (Mahoney, 2003, p.7). Jonassen notes that every individual orders information in his or her mind in certain ways. This sense of self aids in interpreting the world and scaffolds an individualistic knowledge platform which one needs to build learning experiences (Jonassen, 1993).

This concept of self and how we organize our own cognitive structure is at the heart of constructivist design principles. Again, the idea is to center the learning experience around the learner's own construction of meaning:

> [For Bruner] learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. (cited in Hannon & Adkins 2002, p.5)

This concept of self-constructed meaning can be particularly challenging in a CEI environment. Much like the concept of order above, the design emphasis has to be on immersing the learner in an environment of relevant contextual information. By allowing individuals room to solve learning problems in their own way, the resulting experience will involve deeper levels of processing and reasoning. This, in turn, allows for higher order skill and knowledge acquisition. From a practical standpoint, the most useful CEI environments involve "learning contexts. . . which are problem or case-based, that immerse the learner in the situation requiring him or her to acquire skills or knowledge in order to solve the problem or manipulate the situation" (Jonassen, 1993, section 2.3). This can present a design issue in terms of *time* in CEI that is difficult to overcome. Such self-based context learning is often independent of the rigid timetables required of most instructional models. A compromise needs to be reached in this regard.

Social-Symbolic Relatedness

For the constructivist, learning is inherently a social activity: "Much of the order that we seek and the meaning that we create emerges out of what we feel with one another. We are born in relationship, and it is relationship that we most extensively live and learn" (Mahoney, 2003, p.7).

Successful interactive environments must be participatory: "the learner [must] engage in a conversation which is goal oriented and one-to-one or one-to-many, or engages in responsive action with interactive content" (Hannon & Adkins, 2002, p.8). The constructivist CEI designer seeks to create a community of learners that emphasizes teamwork, dialogue and situated learning. (Lynch, 1998). Lynch (1998) further discusses Driscoll's idea "that when students worked in teams on major projects they gained skills and experience in leadership, teamwork, communication and organization" (¶ 13). Cognitive development occurs in a social context (Glaser, 1990). According to Jonassen, "Common understandings regularly

result from social negotiation of meaning which is supported by collaborative construction of knowledge" (Jonassen, 1993, section 2.2). This idea of a dialogue, within a social context, that promotes active learning is a core philosophy for the constructivist CEI designer. Learners become active participants in social communities and construct identities that relate to those communities. (Hannon & Adkins, 2002) This leads to greater depth of learning.

When designing an interactive platform for learning, Jonassen calls for building a virtual world where students:

> . . . can work together to solve problems, argue about interpretations, negotiate meaning....the learner is electronically engaged in discussion and interaction with peers and experts in a process of social negotiation. Knowledge construction occurs when learners explore issues, take positions, discuss positions in an argumentative format, and reflect and evaluate their positions. As a result of contact with new or different perspectives, these activities may contribute to higher level learning... (Jonassen et al, 1995, p.16)

The challenge for constructivist CEI designers is in creating interactivity and feedback that supports learning as a social context. Meaningful constructivist learning has to involve connection with other human beings: facilitators, peers, mentors, and all manner of acquaintances.

Designing a Constructivist Virtual Learning Environment

When it comes to designing CEI there are several legitimate concerns regarding budget and availability of technology and bandwidth that cannot be addressed in this paper. Rather, what follows are some suggestions for creating CEI that might fall under the umbrella of constructivism. They are by no means all-inclusive.

One of the disconcerting things about constructivism is that, due to its very nature, it defies clear encapsulation and categorization. There is a debate as to whether this is a strength or weakness. However, as Jonassen points out, just because all learners have the ability and potential to construct multiple meanings from the same information, does not mean we will have "academic chaos" (Jonassen, 1993).

Given the emergent nature of constructivism and the inherent need for individuals to be able to construct their own meaning (and therein their own learning experience), the challenge to create CEI with appropriate feedback and

interaction is a daunting one. Most of the current CEI is based on convergent and objectivistic thinking. It tends to follow a linear path toward solving specific problems or achieving well-defined goals using largely predetermined parameters (Lynch, 1998). To design constructively, one must begin to think differently.

So, where does one start? First, remember that the learner is to be placed in the center of the CEI experience with the technology used to "support and scaffold the learners' exploration and constructions of knowledge and meaning" (Hannon and Atkins, 2002, p. 5).

Next, ask: "How do I want my constructivist virtual world to look?" To facilitate this, I propose four parallel design concepts:

- Determine what interaction and feedback in your CEI would be contextually meaningful.
- Determine how these contextually meaningful types of interaction and feedback will be placed in the media.
- Determine the role of the teacher/facilitator.
- Determine a means of evaluation.

Contextually Meaningful and Placement in the Media

Understanding the basics of interactivity allows one to begin the process of "transforming learning content into a contextualized interactive experience" (Hannon & Atkins, 2002, p.7). Note that contextually meaningful interaction needs to take into account the three modes of interaction, two discussed earlier in the paper, purposed by Hannon and Atkins (2002). Effective constructivist CEI must be:

1. **Meaningful**: the interactive content engages the learner in meaningful activities, with a level of adaptive response and/or immersion in the learning experience,
2. **Participatory**: as the learner engages socially in a conversation which is goal oriented and one-to-one or one-to-many, or engages in responsive action with interactive content,
3. Provides a sense of **control**: a significant level of agency or influence for the learner through the interactive experience. (p.7)

There are limitless ways to design constructivist interactive CEI. How one goes about it is based largely on personal choice and instructional design limitations concerning available resources. The opinions vary as to which types of interaction and feedback best serve which purposes and how and where they should be used. Boyle

(1996) makes some suggestions as to the focus of placement of interactive media. What is chosen should focus on:

- construction of knowledge rather than instruction;
- developing contextually authentic rather than artificial learning tasks;
- setting collaborative tasks within clearly defined social contexts;
- giving students voice and ownership within the learning process;
- enabling students to construct knowledge from their own life experiences; and
- awakening students to their part in the knowledge construction process.

Remember, the computer is a useful tool, but students should learn with and not from computers. Whatever tools are chosen should engage learners meaningfully. Otherwise it becomes only so much noise. The interactivity chosen should be meaningful, social, relevant, and essential to the cognitive development of the learner(Moller, 1988).

One problem is the discussion about interactivity too often centers around the capabilities of the software and ignores the learning process. What is required is a more holistic approach that moves from designing interactive software to designing interactive *experiences* (Hannon & Atkins, 2002).

Role of Teacher/Facilitator

It is generally argued that in the constructivist model the teacher should assume more of a facilitator role and shift "from the proverbial 'sage on the stage' to the 'guide on the side'" (Shneiderman, 1998, Introduction). Shneiderman (1998) goes on to comment: "Appropriate design for educational technology supports the teacher-student relationship by enabling teachers to propose more ambitious challenges, tailor guidance to individual student and team needs, and give more detailed evaluations" (Section 2, ¶ 7).

Jonassen refers to the instructor as "a coach who provides help directed at real difficulties at critical times" (Jonassen, 1993, section 3.2.1). Perkins (1992) explains that "it is the job of the constructivist teacher (or interactive technology) to hold learners in their zone of proximal development by providing just enough help and guidance, but not too much" (p. 163).

Brooks and Brooks (1999) elaborate on the constructivist teacher's role in the brick-and-mortar

classroom, but the same idea applies to CEI: "In a constructivist classroom, the teacher searches for students' understandings of concepts, and then structures opportunities for students to refine or revise these understandings by posing contradictions, presenting new information, asking questions, encouraging research, and/or engaging students in inquiries designed to challenge current concepts" (Introduction). Obviously, one must work within the limitations of the available media but still strive to make the teacher's role challenging and proactive. The instructor must be able to step down from the podium and assume an active listening and participating role as a coordinator, a manager and a facilitator all at the same time. This constructivist approach is in marked contrast to the typical objectivist, lecture model that dominates the modern classroom.

Determining a Means of Evaluation

For CEI, holistic constructivist assessment and evaluation is a challenge and can be very time-consuming. In a constructivist environment, learning outcomes are not set or even clearly defined. Unlike objective tenets, learning is not necessarily goal-driven. Teachers in constructivist environments do not tend to identify specific goals and objectives. Instead "evaluation in constructivist environments is context dependent. That is, the context within which knowledge is constructed is taken into consideration during evaluation" (Vrasidas, 2000, p. 11).

Each individual brings to the constructivist class a unique perspective and understanding. This, in turn, calls for individualized evaluation from multiple tools for assessment. The challenge is to create interactivity and feedback that emphasize the process and not the end result. In a wired environment, evaluation is an ongoing process: "It is not a separate step coming at the end of the process of development and implementation. In constructivist environments evaluation is constant and part of the learning experience and it is used to provide feedback to both the learner and *teacher*" (Vrasidas, 2000, p. 12).

Constructivist developers must create ways of gauging how much learning has occurred and examine the growth of the individual in terms of thinking, learning, and doing. So, feedback and interaction will often be spontaneous and emergent and require close interaction between participants and the instructor(s).

Vrasidas (2000) shows us that Eisner, Jonassen, Duffy and several others advocate portfolios and authentic assessment in constructivist evaluation techniques. This can fit nicely in a constructivist CEI environment. Students can complete portfolios during the class and present them to classmates and the instructor for additional feedback and critiquing. This is similar to the theories of holistic evaluation underlying hermeneutics:

> A hermeneutic approach to assessment would involve holistic, integrative interpretations of collected performances that seek to understand the whole in light of its parts, that privilege readers who are most knowledgeable about the context in which the assessment occurs, and that ground those interpretations not only in the textual and contextual evidence available, but also in a rational debate among the *community* of interpreters. (Moss, 1994, p.7)

Here we see that even the evaluation process is based on a sense of social interaction. Most everything in the constructivist CEI is open to negotiation and change. Instructors in this environment have to be comfortable with the open-ended nature of the feedback and interaction. Holistically, assessment can take many forms and all the parts have to be seen as contributing to the whole.

Specifically, Vrasidas outlines how interactive evaluation in CEI might be based on: "student reflection papers, student participation in online discussions, student moderation of online discussions, student self-reflective journals, weekly assignments, team projects, student presentations, observations and interviews with students, and student evaluation of their peers' work" (Vrasidas, 2000, p. 11). The constructivist environment is dependent upon multiple levels of interactivity and feedback.

Conclusion

CEI based on constructivist principles shows real promise. However, constructivist approaches to this medium are not without critics. Many claim that learning cannot be properly evaluated without clearly defined objectives (Vrasidas, 2000). Even though pioneers in the field, like Seymour Papert, have shown impressive learning improvements in younger children using constructivist models (Papert, 1980), Jonassen and his colleagues not that constructivist learning *may* be better suited to university environments

since they require higher order thinking and learning skills and acquisition of knowledge at more advanced stages (Jonassen, 1993). Constructive CEI relies on learners being able to manage their own time and learning tasks. Learners must also engage in extensive interaction with their peers and with the online environment (Vrasidas, 2000). From this, it seems, generally, one needs a mature and a focused learner to effectively benefit from a constructivist paradigm. Constructivist CEI poses unique challenges, and feedback and interaction needs to be well thought out to make the most of the benefits of constructivism while limiting the inherent drawbacks.

As with all things, common sense plays a role in designing feedback and interaction in CEI. The object should not be to design a constructivist environment from a purist sense but rather to use available resources and build upon constructivist ideals to engage the learner as deeply as possible and to guide teaching and evaluation practices.

Constructivism is not an educational panacea. However, when designed properly, the constructive CEI environment can be an effective tool for increasing interactivity and feedback and thereby make learning more personal and active. This increases the chances of actually churning out those independent thinkers, who are life-long learners, industrious and innovative team players, and who are actively involved with the community that so many schools claim to produce.

Mahoney, with tongue firmly planted in cheek, muses on the idea that there are two kinds of people in the world: those who believe there are two kinds of people and those who do not (Mahoney, 2003). In the world of computers there are only two kinds of numbers: ones and zeroes. Yet, out of those two numbers comes limitless potential for individualized educational opportunities. If this potential is to be realized, it is important to heed the words of Robert Reich, Secretary of Labor in the first Clinton presidency on the direction of our current educational system:

> Children [move] from grade to grade through a preplanned sequence of standard subjects, as if on factory conveyor belts. At each stage, certain facts [are] poured into their heads. Children with the greatest capacity to absorb the facts, and with the most submissive demeanor, [are] placed on a rapid track through the sequence; those with the least capacity for fact retention and self-discipline, on

> the slowest. Most children [end] up on a conveyor belt of medium speed. Standardized tests [are] routinely administered at certain checkpoints in order to measure how many of the facts [have] stuck in the small heads, and product defects [are] taken off the line and returned for retooling. As in the mass-production system, discipline and order [are] emphasized above all else. (cited in Pond, 2000)

Whenever one learns something new, one changes. The next time one learns something, from the academic to the mundane, one is a different person applying a different approach than before. Constructivism, in the abstract, is the place where all the Venn diagrams converge. It embraces change and remains inclusive; It dares to address the questions “What is learning?” and “What are the fundamental processes that underlie it?” Adapting wired educational models to constructivist theory is not easy, but it is necessary and worthwhile.

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Touring Mars On-line, Real-time, and in 3D for Educators and Students.

James G Jones
Department of Technology and Cognition, College of Education
University of North Texas, Denton, Texas, USA
gjones@unt.edu

Jeramie Hicks
Created Realities Group
hicks@tapr.org

Abstract: This paper presents a project started in 2003 that placed over 97% of Mars' topography from NASA into an interactive on-line learning environment for use by educators and students connected to the Internet. The possibilities for bringing students into an immersive environment to discuss and participate in math and science are many. This paper will discuss the 3D technology being developed and the educational use for math and science in 5th grade.

Introduction

The planet Mars has always fascinated us; however, much of that fascination started with misunderstanding and myth. (James, 2003) Mars now represents a future challenge of our nation that the President is proposing in a new space initiative. (Bash, 2004; The Whitehouse, 2004) We have been sending missions to Mars to study the planet since 1964 when the Mariner 4 spacecraft flew by the planet Mars and sent back the first pictures of the Martian surface. (NASA, 2004a) In 1997, the Mars Global Surveyor reached the planet to begin its research. Part of that voyage of discovery included an experiment called the Mars Orbiter Laser Altimeter (MOLA). This experiment collected elevation data (heights) of the surface of Mars. While the research was released during the experiment, not until late 2002 did a normalized data set become available.

When the MOLA normalized data became available (NASA, 2004d), we saw this as a perfect opportunity to show the potential that 3D on-line environments could have in education. The MARS on-line project allows student/teachers/researchers to access information that represents real data collected about the planet Mars. Mars on-line allows a visitor to view in real time across the Internet on as low as a dial-up modem some 1 billion elevation measurements gathered between 1998 and 2001 by NASA (some 2 gigabytes of information). Our technology approach allows us to present small environments like a classroom discussion or scale up to very large environments like Mars within a single methodology. Students can tour and discuss the environments using collaborative tools (audio, text, etc). The real potential in this approach is the ability to provide equal interactions across various Internet user connection speeds. This is an important consideration for students affected by the digital divide.

Mars Global Surveyor

The Mars Global Surveyor (MGS) was launched on November 7, 1996 and research orbit on September 12, 1997. (NASA, 2004b) The Mars Global Surveyor was the first spacecraft to be launched in a decade-long exploration of Mars by NASA. Since the MGS was launched, NASA launches have occurred every 26 months in 1998, 2001, 2003 and 2005, involving orbiters, landers, rovers, and probes to Mars. Figure 1 is a graphic of the spacecraft.

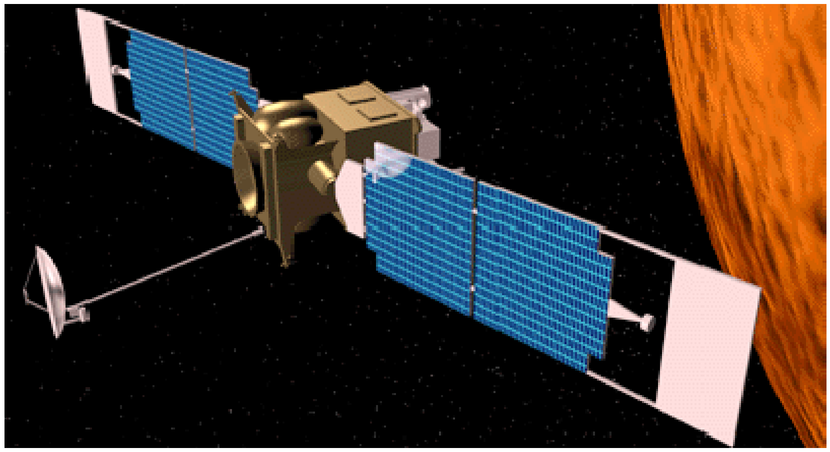


Figure 1 – Mars Global Surveyor computer graphic of the spacecraft. (NASA, 2004a)

MOLA Project

Our project has focused on the data collected by the Mars Orbiter Laser Altimeter (MOLA) project. (NASA, 2004c) The MOLA project collected data until the end of June, 2001, when the instrument failed due to a technical problem (oscillator malfunctioned). Figure 2 shows a photograph of the instrument separated from the spacecraft. The project was designed to map the Martian global topography. The MOLA package works by transmitting a laser pulse from the spacecraft in orbit down towards the surface of the mars. The pulse is then reflected off the Martian surface (or cloud) back to the instrument, where the return is detected. The two-way travel time is recorded, giving a measure of the distance between the spacecraft and the surface. Corrections were then made to the recorded distance based on atmospheric effects and accurate tracking of the spacecraft position allowed an estimate of the surface altitude or cloud height to be adjusted.

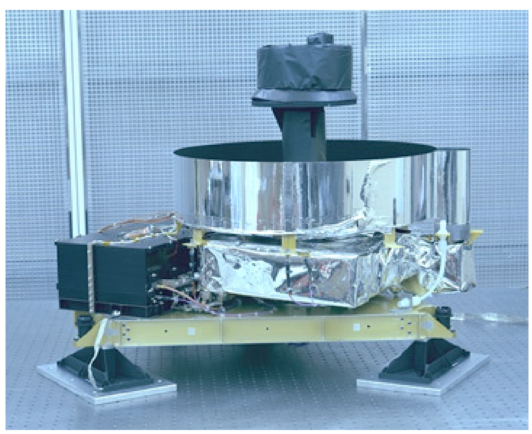


Figure 2 – MOLA (NASA, 2004c)

The dataset we reference consists of more than 600 million measurements gathered between 1999 and 2001 and was adjusted for consistency. This same dataset has been used by the US Geological Survey to generate new topographic map of mars shown in figure 3. This map can be downloaded from the USGS web site given in the reference section.

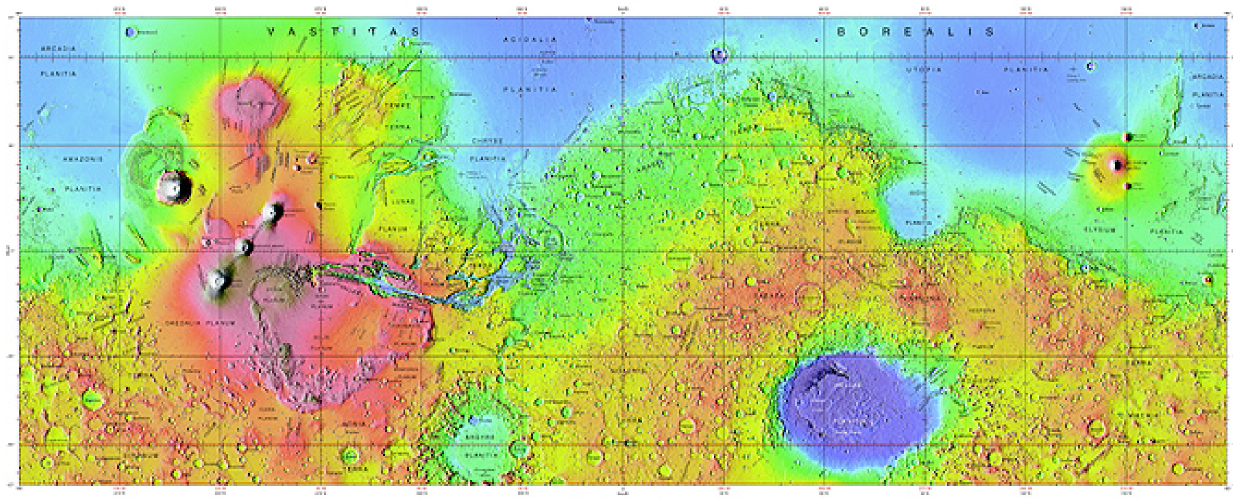


Figure 3 - Mars Topographic Map M 25M RKN (U.S. Geological Survey, 2004)

Created Realities Group

The Created Realities Group (CRG) was formed in 2001 with the focus to research and develop 3D online collaborative systems. (CRG, 2002) The goal is to provide a single, low-bandwidth, multi-purpose interface that allows the delivery of distributed education in both asynchronous and synchronous modes. CRG is working towards combining collaborative tools (audio, chat, overheads, white boards, etc), unified communications (e-mail, conferences, etc), and 3D environments such that it increases discourse and engaged learning. The presentation of the NASA Mars global topographic data demonstrates the ability to scale the system from a single classroom to an entire planet. The portal-based 3D presentation system provides for just-in-time display of information. This allows the over 2Gigabytes of MOLA data to be presented just as the user needs it to be displayed, allowing Internet connected users on as low as a dialup connection to access the world information. The elements of collaboration are then woven into the data presentation to allow students to work in the environment to achieve goals and learning. This will be discussed later in the paper.

Mars Online Project

The first step was to take the MOLA dataset and break it into portals, which are the basic building objects of the CRG 3D online system. The MOLA dataset represents some 600 million entries giving longitude, latitude, and elevation in 0.463km increments in long sequential lines of data representing sweeps of the MOLA package as it made orbital passes over the surface of Mars. Each portal is created from 64x64 data points creating a 29.623km square surface by portal (0.463km * 64 = 29.623sqr km). The 600 million entries generates a little over a 2 Gigabyte database of portal and related group information. Table 1 shows the basic information that was generated by this approach.

Table 1: CRG Mars Online Project Specifications (Created Realities Group, 2002)

- Portals:
  - 253,440 contiguous portals
  - (352 portals NS x 720 portals EW)
- Portal Size Representations:
  - Single Portal: 29.632 km square
  - Next 9 High-Res: 88.896 km square
  - Next 16 Low-Res: 148.16 km square
- Maximum Visible Distance: 88.896 km
- Portal Coverage of Mars: 97.777%
- Travel Speed: Approx 2700kph
- Total Visible: 25 portals
- Database: 12 million group links entries

This allows a user to login into the server and visit any location of the planet Mars that is available in the map data. The following figures are screen shots from the client.

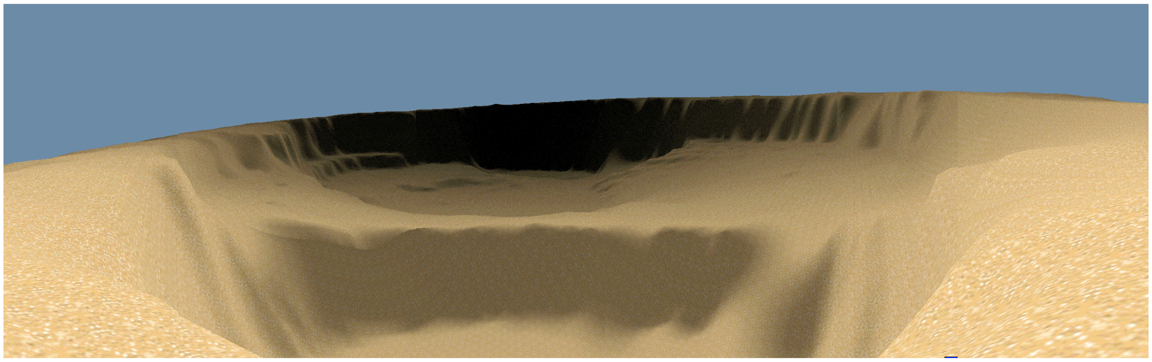
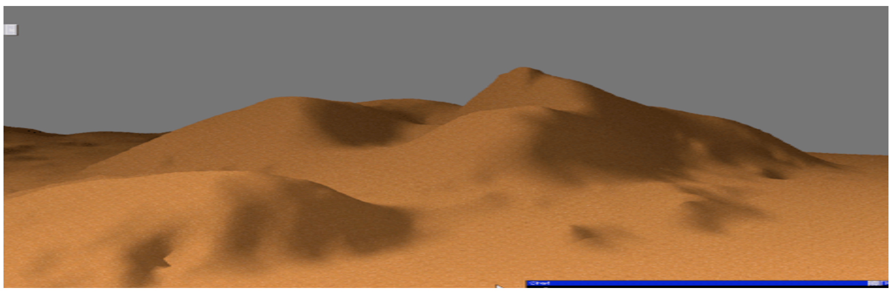


Figure 4 - Panorama Shot of Olympus Mons, Top Cone (MARS_19.0_227.0).



Nicholson crater central peaks (MARS_0.5_195.0).

Conclusion

We are currently working to develop several client widgets that can be used towards the Texas Essential Skills (TEKS) in the areas of 5th grade math and science. The concepts of measuring and scientific investigation can be placed into the Mars environment in order for the students to explore and learn together while completing these essential skills. The potential of taking scientific data and allowing students access to it in a collaborative settings allows new methods of engagement to be employed across many areas of the curriculum.

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INSTRUCTIONAL SYSTEMS AND EDUCATIONAL TECHNOLOGY INITIATIVES AT CARNEGIE ONE UNIVERSITIES:

Maria Lorna A. Kunnath, Ed.D.
Education Consultant, MLAK EduSoln
Tel5307503598
IP15303503158
Cell15309027546
lorna518@juno.com

Abstract

The Author/Consultant performed a web-based research study of Instructional Systems IS and Educational Technology EdTech Initiatives At US Carnegie One Universities during her Research Analyst function at the University of California Davis School of Education until November 2003. She followed through rigorous website visits to Carnegie Universities to obtain information on the IS and EdTech academic program offerings as well as IS and EdTech non-academic ventures. She then compiled and analyzed the information to answer the following research questions: How many and what types of Educational Technology institutes have been in place in each university?;How many and what types of Educational Technology Research Projects and Educational Research Outreach are happening in each university?;What is the correlation between the US News Ranking of Best Schools of Education and the level of IS/EdTech Initiatives? If there is a correlation how significant is it? Analysis of results revealed some interesting observations.

Introduction

A recent North Central Regional Educational Laboratory NCREL meta-analytic summary research[1] of 20[2] studies on Educational Learning technologies effect on student learning revealed that teaching and learning with technology had a small, positive but significant ($p< .05$) effect on cognitive, affective and behavioral outcomes of students. The study adopted the five standards for effective pedagogy by the Center for Research on Education, Diversity and Excellence namely: (NCREL p.8)

1. Teachers and students producing together (joint productive activity)
2. Developing language and literacy across the curriculum (language development)
3. Making meaning (contextualization)
4. Teaching complex thinking (Challenging activities)
5. Teaching through conversation (Instructional conversation)

In the same line of thinking, the American Council on Education in its 2002 Research Report[3] *To Touch the Future: Transforming the Way Teachers are Taught. An Action Agenda for College and University* calls for a unified effort and action among University Presidents, Deans, Faculty, Provosts, Governing Boards, Policy Makers,

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[1] "A Quantitative Synthesis of Recent Research On the Effects of Teaching and Learning With Technology On Student Outcomes by Waxman. (2002) by H., Connell, M. and Gray, J.

[2] Bayraktar (2001-2002); Blok et al. (2002), Cavanaugh (2001); Christman & Badgett (1999); Christmann et.al (1997 and 1997); Lee (1999); Lou et al (2001); Whitley (1997).

[3] A 38-page Document produced by the American Council on Education President's Task Force on Teacher Education formed in 1998 and composed of College and University Presidents and School Leaders.

Business Leaders and all Americans to improve the way our teachers are educated. The sixth Call to Action (p.22) cites the importance of equipping Teacher Education Programs with essential resources such as Equipment, Facilities and Manpower for educating future teachers on uses of technology. The Call To Action in this report gives technology a major role in chipping away hard-to-reach solution of building technologically competent breed of high quality[4] teachers. In the same report, teachers surveyed[5] lamented that the Teacher Education Programs who have some technology built in the In-Service Teacher Preparation Program are quite brief to be useful (p.9, ACE Report) when applied in the classroom. An ETS Study by Harold Weglinsky supports the same finding citing that meaningful teacher professional development is "one that guarantees student learning of important skills and concepts". Weglinsky analyzed the National Assessment on Educational Progress NAEP data on teacher input, professional development, classroom practices and linked them to student achievement in science and mathematics. Interestingly he noted that the NAEP data[6] was difficult to determine whether such PD's could be considered meaningful[7] or not. In his study he found support that teaching that exercised higher order thinking skills among students equated to effective teaching (ETS p.29) and lead to improved student performance. The ETS study is noteworthy for various reasons: By stating that teacher quality (more than class size) impact student scores, the study established a relationship between professional development, teacher inputs in the classroom with student performance and effective classroom practices. The study used a national versus a small sample and used a multilevel data analysis. Weglinsky cited the limitation of his cross-sectional study of eight graders and suggested looking at longitudinal studies where subjects are followed over a period of time. Further he recommends providing ample Professional Development opportunities for teachers[8] training them on effective classroom practices. Like any research beset with limitations (from categorization of variables to selection of sources of information), the NCREL study did however, uncover an urgency to continue undertaking more meta-analytic studies by researchers on recent practices of the same theme.

In implementing a statewide initiative on using instructional technologies to improve student performance, the state of West Virginia used an Instructional Systems Design model of Access+Attitude+Training AAT and enabled provision of: Networked computers (3 minimum, printers) per classroom; Software to teach basic skills in Reading, Language Arts and Mathematics; Professional Development by 2 companies (IBM and Jostens) for Teachers on basic computer use. An independently commissioned research group studied the statewide AAT Program on student outcomes of 950 5th graders in 18 stratified sampled schools using: Self-report interviews on students, teachers and principals for data on attitude; Measures of achievement (scores) from Stanford 9 test. Comparing the pre-post implementation using Multiple Regression Analysis revealed an improvement in scores in the basic skills of Math, Reading and Language Arts from 1995-1996 to 1996-1997. Overall, the study uncovered a statistically significant correlation between technology use and student improvement. The same study indicated that gender and equity were addressed in the use of the model i.e., learning from a computer generated interaction that was the same regardless of the person's gender and, the schools that benefited the most from the

4 Strong in content areas with high academic achievement
5 NCES 1999
6 which lumped up the number of 'yes' response to having had professional development
7 months or semesters of training
8 sustained training on higher –order thinking skills

program were the neediest schools. This study is limited in looking at application of technology for higher-order learning skills that is slowly becoming the norm in classrooms these days.

The Research Study

Not to be confused with the technical support team in any academic department, it is important to make a distinction between Instructional Systems/Education Technology Initiatives as discussed in this report with the everyday activities of Technical Support or TechHelp so often a part of any organization. The latter deals with the seamless day-to-day IT (Information Technology) operation, fixing viruses, from setting up operating systems, configuring systems and connections, upgrading hardware, software and equipment and guaranteeing that they inter-operate when used in the department and that the departmental website is current in both design and content. The Tech Support group have little to do with instructional systems or educational technology except in guaranteeing the smooth interworkings of the software, the hardware and the equipment generic to the particular department e.g. UNIX-based, Windows or MAC and the versions running in each. For example, an IT Tech Support would know exactly why some network connections are faulty, updated drivers for printers and scanners or other digital equipment need to be downloaded from the manufacturer's site to get the equipment to work; or the IP addresses of all PC's and MACintoshes as well as their locations, which rooms are connected or not. They are usually adept at Networking, LAN/WAN operation, updating software for a smooth departmental computing operation.

Besides a basic working knowledge of IT, an IS or EdTech person extends the knowledge in the context of the academe and scholarship, for teaching and learning in the classroom, in research projects e.g. finding the impact of images on children's reading skills, math and science conceptual skills etc. This academic orientation advances the IS discipline in education and, in training would-be teachers to become discerning users, reflecting and constantly analyzing designs, systems and finding meanings in new applications interspersed with ways of integrating their own findings alongside their own teaching 'styles'. Part researcher, part cognitivist, part designer, part software developer etc., an IS or EdTech professional is expected to wear many 'hats' in enabling a total systems solution to using technology to learn. Besides being a good teacher, the 21st century teacher must also become transparent and creative users of the new learning tools. Schools of Education, entrusted to be the main institution for training teachers through a Technology Focused program, are in the best position to realizing that goal.

Focusing on Instructional Systems and Educational Technology Initiatives, this researcher investigated how the different Carnegie Research Universities approached the preparation of teachers in the Schools of Education particularly on infusing technology in the classroom in its curriculum, improving pedagogical aspects of technology through faculty initiated research and disseminating best technology practices through its outreach efforts. A web-based survey of 88 Carnegie Universities was done through visits to each university website. The number of universities classified as a Carnegie, i.e., Research University has, since the survey started, increased. Time to complete the web-based study being the constraint, this researcher

decided to report on the 88 universities and reserve updating the information i.e. including the newly added universities, at a later time. Information about each university website consisted of:

- School of Education Mission
- Instructional Systems IS and Educational Technology Graduate Academic Program
- Distance Education Initiative
- IS/EdTech Support
- IS/EdTech Research Projects and Outreach.

Research Projects cover Faculty initiated, and projects originating from the already existing centers. Quantifying the number of research projects posed a problem due to a difference in each university's way of presenting information. While some websites provided a very thorough list even dating 3 years back, others in contrast provided limited information with the volume comprising only projects currently undertaken. Outreach was also difficult to quantify at times. Sometimes the website lists only the center's major programs without mentioning particular projects in each as well as the frequency count. In such situations, this researcher would simply count the total number of major programs. The US News rankings for Best Schools of Education in the country was aggregated in 4 classes viz.,

1	Top	1st-20th rank
2	Excellent	21st-40th rank
3	Very Good	41st-60th rank
4	No ranking	61-up

The summary tables are in MS Excel files. The correlational analysis for rank and research institute, rank and research projects and rank and service and outreach were done using SPSS.

The study aimed at answering the following questions:

- How many and what types of Educational Technology institutes have been in place in each university
- How many and what types of Educational Technology Research Projects and Educational Research Outreach are happening in each university?
- What is the correlation between the US News Ranking of Best Schools of Education and the level of IS/EdTech Initiatives? If there is a correlation how significant is it?

Research Analysis and Findings

<u>Research and Outreach</u>
SOE Research generates funds for projects that seek new ideas and/or testing and refining old ones and possibly to implement new outreach activities as a result of tested strategies. Review of the matrix generated from this research[9] revealed that funding from University SOE Education Technology-related projects came from the Government EdTech Grants, the National Science Foundation, Philanthropic and Grant-Funding Institutions such as the Mellon Foundation, Pew Charitable Trusts, Educause,

9 Appendix Sample of Research Activities cut-pasted from MIT, Columbia University, FSU websites

Ford, Spencer and many more. Funding amounts ranged from $500.00 to several million dollars per project allocation. Further, this researcher found a significant correlation between US News ranking of Best Schools of Education with the University's School of Education level of Instructional Systems & Education Technology Academic initiatives. Those that had IS/EdTech Academic programs and Teaching and Learning Center, Research and Outreach in place tend to have a Best School of Education ranking. Figure 1 below shows the US News Best Education Schools in the nation. Note that the level of outreach is high in four universities; level of research is high in five universities, while number of teaching and learning centers is highest in one university.

Outreach Research Teaching Learning Center

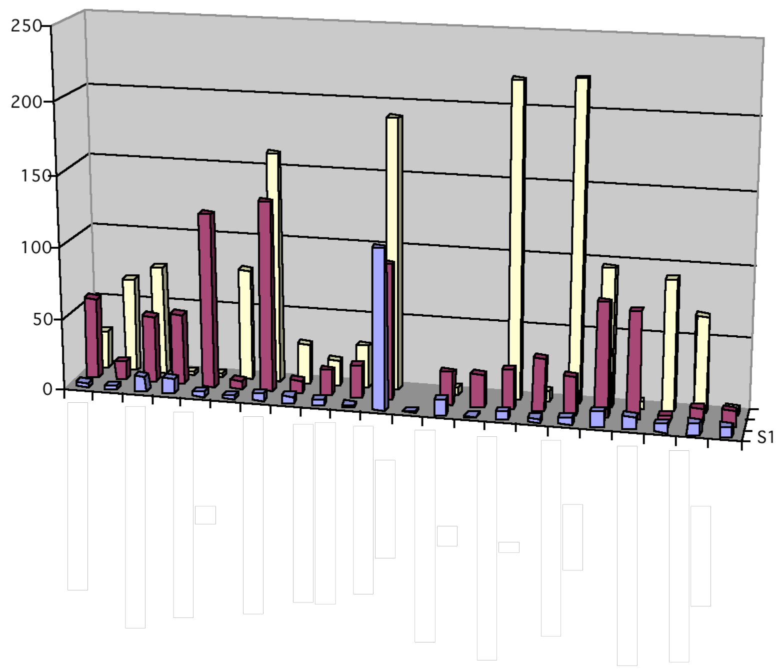
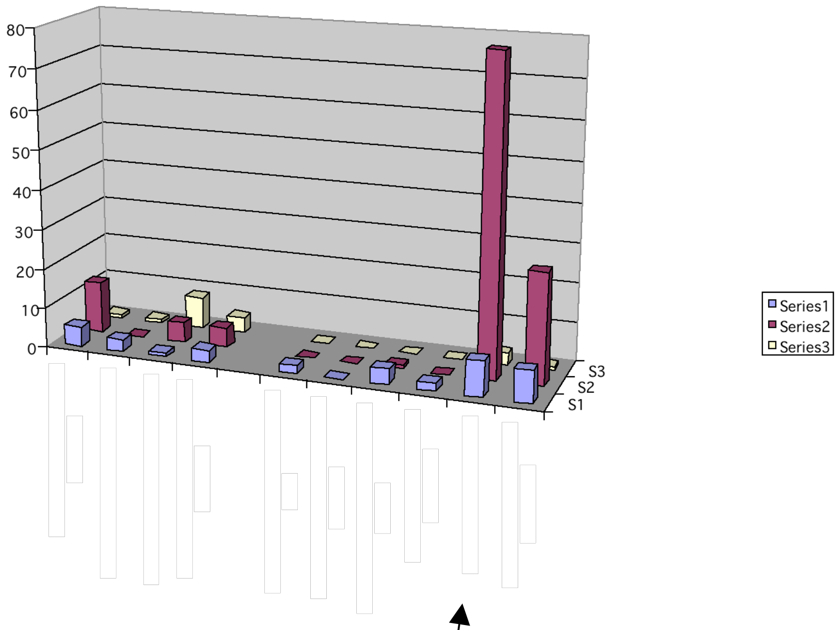


Figure 1 Carnegie Universities with US News Best SOE Ranking

Among the California Universities, Stanford ranks the highest in research projects followed by USC and UC Berkeley (Fig. 2). Except for UC Irvine, Educational

Technology Outreach activities for all three universities are at par with each other.



Stanford University

Figure 2 California Universities

Florida State University has the most research activities among the group of universities (chart below) generated because of Faculty initiated projects and Learning Institute/Center initiated projects.

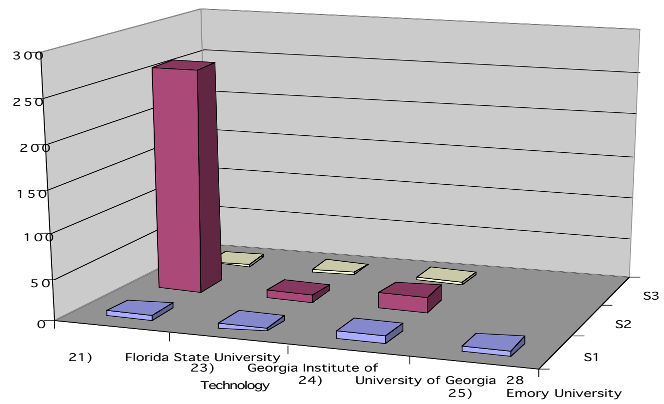


Fig. 3 Southeastern Universities

Similarly, University of Kansas has a similar level of research activity when compared with these universities (Fig. 4).

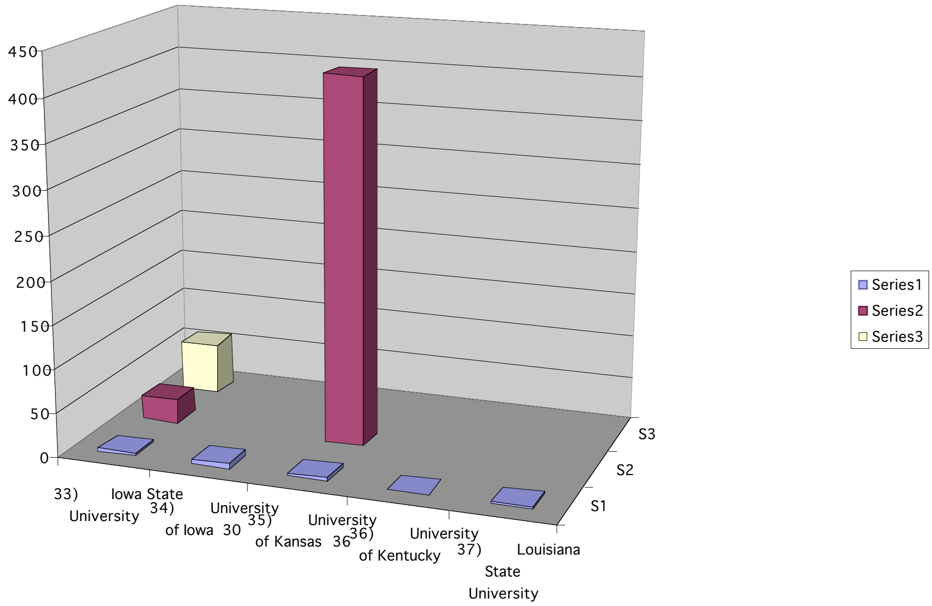


Figure 4 Southern Universities

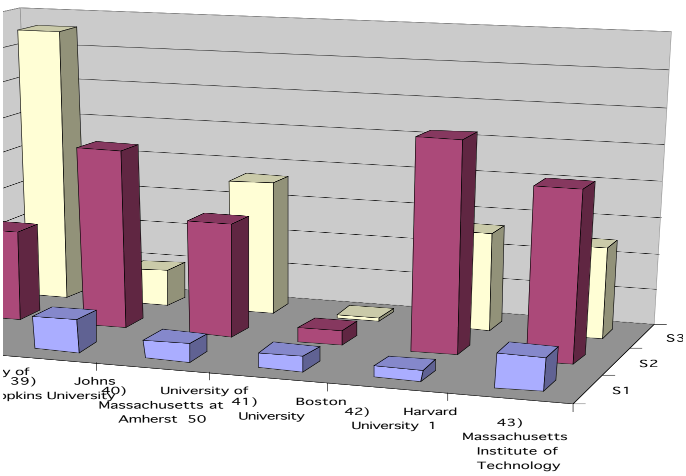


Figure 5 MidAtlantic Universities

Except for Boston University, the mid-Atlantic universities (Fig. 5) exhibit a very similar trend in their number of teaching and learning institute, research projects and outreach activities. With the exception of University of Maryland, research projects exceed the number of teaching learning labs. The number of outreach activities is surprisingly low for Washington State University having the highest number of research projects (Fig. 6).

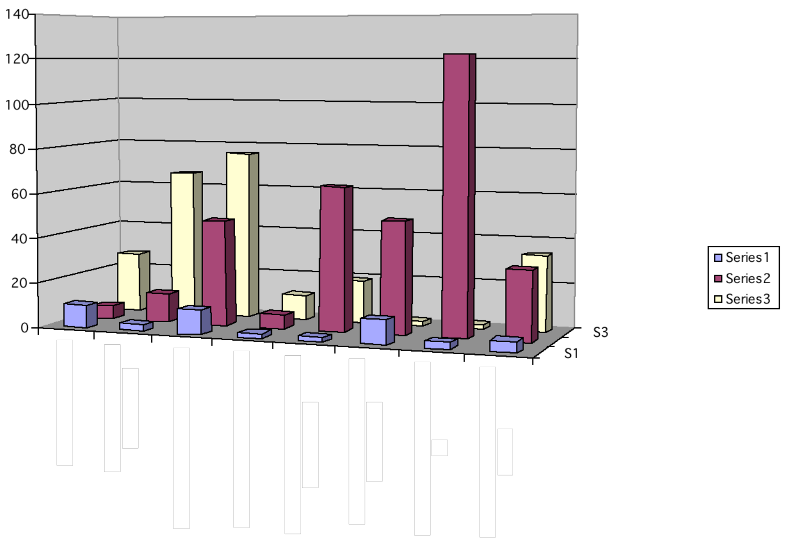


Figure 6   MidWestern Universities

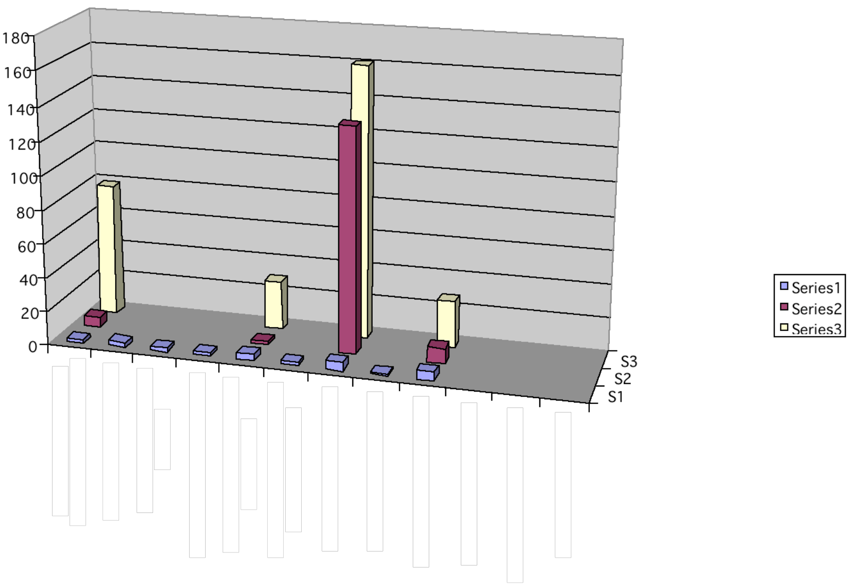


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Figure 7 Northeastern Universities

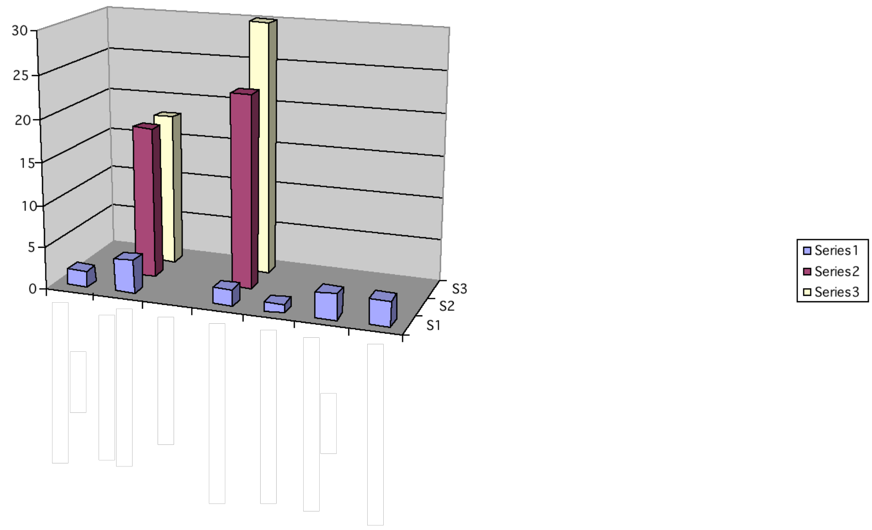

Figure 8 Northwestern Universities

Rutgers and Ohio State have an equal number of Teaching/Learning Labs/Institutes/Centers while Columbia University has the highest number of research and outreach activities.

Majority (3/4 of those surveyed) Table 1 revealed having Educational Technology or Instructional Systems IS component within their Schools of Education Curriculum and Instruction Department 37 of which have rankings in US News 2003 Top US Education Schools. Only a meager 25% of the surveyed universities have no IS Academic Department focus. While a few are affiliated with another academic department or School[10], most IS or EdTech Programs are tied with the University's School of Education. Through its Ph.D./Masters/and Bachelor's Program and support for Centers[11] designed to improve schools using technology, UCLA, UCB, UCI and UCSB Schools of Education share the same vision of enhancing the teaching and learning process. Of these four universities, UCLA ranked 4th while UCB ranked 11th in US News 2003 Top Education Universities. Besides an IS-based academic department, these same 4 universities also provide non-academic educational technology support units as well as established online learning programs. Two other California Carnegie universities having a similar arrangement are Stanford University[12] and University of Southern California[13]. Both, including the four UC's, boast of specialized labs and research institutes devoted specifically to the study and experimentation of learning technologies.

Three UC Universities (Davis, San Diego and SF) do not have an IS or EdTech Academic Departments. Regardless of IS or IT academic offering available in the university, these same universities instead have IS Support Systems in the form of

10 Department Computer Science, Engineering or Psychology or a combination in partnership with the School of Education
11 UCSB's Effective Schools Teaching and UCI's Center for Collaborative Research in Education CCRE
12 Ranked 2nd, US News 2003.
13 Ranked 38th, US News 2003.

Teaching Resources[14] or Media Development Centers[15]. Majority of the universities do have non-academic Instructional Technology Support Systems. Ideally, these IT Support Centers usually provide ample resources and opportunities for faculty and students to experiment using a variety of tech tools for their courses from building WebPages to producing digitally enhanced course modules. A normal course of activity conducted on a regular basis in these centers would be testing and experimentation, project showcase s, impact evaluation of developed projects and new software/hardware familiarization. The functions of centers within Schools of Education are linked with the conduct of the school's academic program. Consequently, faculty work are provided a stage to showcase their work and demonstrate their projects. Research projects that evaluate systems, methods, software use with respect to teaching and learning are then easily conceived. Such is the characteristic of well-funded faculty-initiated projects at MIT, Stanford and Columbia University. Students on the other hand work on or, showcase their projects in the labs as part of their coursework. For Teacher Education students, the skills become a regular methods in their K-16 classrooms.

Blackboard, followed by WebCT, seems the most popular Course Management and Delivery Systems. Some have very well established Online Professional Development Programs for Teachers, whereas some have selective EDU courses available online. Schools that prepare teachers such as UCSD[16] and Princeton University[17], have a component built in as part of the curriculum or as part of outreach and service that prepares teachers to use technology. Some IS Academic Programs are designed to prepare technologically competent teachers and Educational Leaders. The trend suggests that some IS-Based academic programs offered by these universities[18] are designed to prepare educators to be designers, developers and evaluators of learning environments. Other universities[19] however, have elected to focus on learning technologies to teach Science and Mathematics. For communication and communication, Maryland has the most developed Interactive Video Network through its University of Maryland UM Interactive Video Network linking all of Maryland schools. Funded mainly through outside grants, Johns Hopkins University boasts of 21 Projects at its Center for Technology in Education.

Curriculum

A. Instructional Systems

University of Connecticut's Ph.D. Program in Cognition and Instruction covers courses in Cognition, Instruction and Learning. It has a strong quantitative base with four core courses on Quantitative Methods (9) EPSY 309/313/342/346). Those wishing to pursue Curriculum and Instruction complement their technology focus with courses in Software Design, Distance Learning, Interactive Learning Environments, Video

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14 UCD TRC, UCSD Instructional Worldwide Web Development Center
15 UCD Mediaworks, UCSD Instructional Worldwide Web Development Center
16 Teacher Education Program Ed.D. In Teaching and Learning
17 Program in Teacher Preparation
18 such as UCB, UCSB, Stanford, USC, University of Connecticut, Florida State U, Georgia Institute of Technology, University of Michigan, University of Missouri, New Mexico State University, New York University, University of Pittsburgh, Pennsylvania State University
19 viz. UCB, Colorado State U, Georgia Institute of Technology, Rutgers, Columbia University, Ohio State University, North Carolina State and Tufts University

Designs, Simulation and Learning while those who want to focus on Measurement and Evaluation would take Design of Evaluation Instruments, Program Evaluation, Sampling and Survey Research Methods, Linear Models, Modeling and Qualitative Methods of Educational Research. Its Instructional Psychology focuses on the Cognitive Models and Systems. Pennsylvania State University's Instructional Systems Program curriculum (Appendix A) consists of (3) 200 level INSYS courses, 23 (400 level) INSYS courses and (26) 500 level INSYS courses and (5) 600 level INSYS Thesis and Dissertation courses. The courses are designed for Educators but the program application orientation is suitable to any instructional setting, from corporate, K-12, to Higher Education. Starting with strong theoretical foundations the courses bring the practical applications the fore through the Design and Evaluation level courses which can range from assessment to design of existing learning environments. Courses on both Quantitative and Qualitative Research are offered during the advanced stage of the program in tandem with Independent Studies, Special Topics, Seminars, Internships, Thesis and/or Dissertation. Indiana University's Instructional Systems Technology Degree Program is a 90 credit hour graduate program designed for preparing professionals for research in Instructional Technology for university or corporate work. The program requires demonstration of computer competencies prior to entrance. The 90 hour coursework is divided into 42 Instructional Systems courses, 27 hours of Inquiry, Educational Foundations, Electives) non-IST courses and 15 Dissertation hours. Steps for the Doctoral Program include:

1. Doctoral Program Outline; Residency
2. MidProgram Review (Instructional Project/Research Project/Portfolio)
   Publication and Knowledge Dissemination
   Written and Oral Qualification
3. Nomination to Candidacy; Dissertation Research Committee Approval; Dissertation Prospectus
4. Dissertation Proposal Defense; Dissertation Final Defense

University of Southern California's Educational Psychology and Technology has 11 Instructional Systems-intensive courses focusing on Learning, Individual Differences, Performance and Design. Columbia University's Communication, Computing and Technology in Education emphasize the linkage between Instructional Systems and Communication and offer Communication courses such as Cinema and the Television technologies. Its Cognitive component courses emphasize connection to the use of computers in instruction. The robust program even includes programming courses levels I and II. The Fieldwork Computing in Education provides qualified students to pursue projects in schools, community agencies, business organizations and communication facilities. Its Topical Seminar provides a forum for examining Instructional Systems issues that examine theories and applications. The seminar also addresses policy implications of Instructional Systems. The Graduate Program consists of (27) 4000 level MSTU courses, (14) 5000 level courses and (21) 6000 level courses.

B. Learning, Design, Technology & Performance Systems Program Focus

Designed to unite all the elements of learning, three disciplines Learning and Cognition, Technology Design and Computer Science are pooled within the Learning Design and Technology Program at the Stanford University's School of Education. The Graduate Program requires completion of 135 graduate coursework and research during residency

at the university. The program requires competencies in four major areas: Curriculum, Instruction, Administration and special areas20, Behavioral and Social Sciences[21], Normative studies[22] and Inquiry (Research) Skills[23]. As in most Doctoral Program, the stages to completion for the Doctoral Program are identical to Penn State's. Its Masters program prepares professionals who can design and evaluate learning environments no matter what the setting. Three Centers complement Stanford LTD's academic, research and outreach vigor:

1. Stanford Center for Innovations in Learning
2. Human Computer Interaction Lab and
3. Center for Research on the Context of Teaching.

Florida State University's Instructional Systems Design has an emphasis in Performance Technology, i.e. Performance Systems Design. The Educational Foundations orientation consists of Core courses and 24 credit hours Electives Courses[24]. This program combines an Internship Process and actual design of Decision Support Systems[25] DSS in the educational context.

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C. Math, Science and Technology Focus

The UC Berkeley MA and Ph.D. curriculum in Education for Mathematics, Science and Technology EMST[26] program is a combination of cognitive science courses, use of modern technology and real-life apprenticeship program for students with teachers and natural scientists. Its Masters and Credential in Science and Math Education

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20 ED344X Technology and Assessment, EDU298 Online Learning Communities, 342X Child Development and New Technologies, EDU224 Information Technology in the Classroom, EDU299X Visualizations, EDU225X Persuasive Technologies in Education.

21 ME115 Human Values in Product Design, PSY166 Seminar on Personal and Social Change, COM172 Psychological Processing

22 ME101 Visual Thinking, ME313 Ambidextrous Thinking, ED312 Interaction Processes in Education, CS377A Introduction to Cybernetics, CS377 Captology, Com269Computers and Interfaces Psychological and Social Issues, CS274A Human Computer Interaction Interaction Design Studio, ENG 295 Interactivity, Narrative and Artificial Intelligence, ME103D Engineering Drawing and Design; ME115C Design Sketching; CS447 Interdisciplinary Interaction Design, CS377E Topics in HCI Design Characters for Computer Games, CS106A Programming Methodology, CS377B Cognition and Interaction Design, STS122 Technology and Culture in the 20th Century

23 e.g. historiography, statistical analysis and computer programming.
ED151X Qualitative Research, ED344XTechnology and Assessment, Quantitative Research

24 EDP5216 Theories of Learning and Cognition, EME5601 Introduction to Instructional Systems IS, EME5603 Intro to Systematic Instructional Design ID, EME5055 Trends and Issues In ID, EME5932 Seminar in ID, Field Internship, EME6691 Performance Systems Analysis, EME6415 Development of Computer Courseware, EME6640Design and Development of and Electronic Performance Support Systems EPSS, EDG Needs Assessments for Performance and System Planning, EME6631 Managing Instructional Development, EME6633 Educational Systems Design, EDP5216 Theories of Learning and Cognition, EDG6328 Alternate Views of Teaching and Learning, EME5601 Introduction to Instructional Systems Design ISD, EME6925 Instructional Materials Development IMD, EDF 5401 General Linear Model, EDF5481 Methods of Educational Research, EDG6363 Practicum in Experimental Learning Research, EDF 5464 or EDF6475 Qualitative Methods in Evaluation or Qualitative Methods of Educational Research, EDG 6365 IS Research Seminar, EDF6980 Dissertation, EDF5432 Measurement Theory, EDF5445 Assessment of Learning Outcomes, EDF55461 Intro to Program Evaluation, EDF5462 Evaluation of New Educational Programs and Practices, EME5604 Development of Instructor-Led Courseware, EME6326 Development of Print Courseware, EME6415 Development of Computer Courseware, EME6507 Development of Interactive Video Courseware.

25 Widely adapted in most corporations, a DSS is a database-driven distributed networked environment with a built-in a real-time advisor to assist the performance of work. This work can be in any department, at any stage of completion and suited to different users.

26 http://www-gse.berkeley.edu/program/emst/emst.html

MACSME's for secondary level of teaching provides financial aid alternatives. The UCB strategy includes an Expert Speaker Series bringing notable renowned Scientists and Educators to dialogue with the student body. Through courses in Computing, Instructional Technology and Communication, Columbia University infuses the use of technology in its Mathematics, Science and Technology Program. Tufts University's multidisciplinary Masters and Ph.D. in Math, Science, Technology and Engineering MSTE Program is a collaboration among the various disciplines viz., Child Development, Education, Mechanical Engineering, Computer Science, Biology, Chemistry, Math, Physics and Astronomy, Center for Engineering Outreach, Center for Science and Math Teaching and the Dudley Wright Center for Innovative Science Education. Its TEACH/21[27] Project essentially prepares would-be teachers to become dynamic integrators of traditional and modern disciplines through modern methods of teaching using technology. In its Outreach program, a Tufts Faculty is assigned to a school district Teaching and Learning Center and work side-by-side with student teacher teams in developing projects and, formulating new methods and pedagogies for the classroom. Rather than having a combined Science&Math program, Rutgers University SOE Graduate Program in Teaching and Learning instead focuses on Math Education independent of Science Education. North Carolina State University's Math, Science and Technology Education Graduate curriculum consist of 30 technology-based courses that provide an introduction, a way to practice proven tech practices through fieldwork and apply these in teaching Math & Science in the classroom. The degree program concludes in a thesis or dissertation research. Ohio State University's Math Science and Technology Education faculty 'are actively involved in broad-scale research, professional development and service projects."[28] Partnered with Atlanta Public Schools, universities and colleges, Georgia Institute of Technology Center for Education Integrating Science, Math and Computing conducts a K-16 Education Outreach using Georgia Tech's Engineering, Math and Science Mentors.

Instructional Systems and Educational Technology Research Projects

The National Science Foundation NSF and the US Department of Education USDE are the biggest sources of funding for educational technology projects (Table 2 Sample of IS/EdTech Projects) originated by SOE university faculty. University of Wisconsin's Center for the Integration of Research, Teaching and Learning secured a massive $10 Million over a period of 5 years from NSF. Penn State University obtained more than US$ 2 Million grant form USDE and more $.5 Million from NSF for a one-year project. In University of Minnesota alone, NSF funded programs approximate $800,000.00 for three projects for 3 years. The two UC's Berkeley and Santa Barbara obtained a total of $1.5 Million. The table clearly illustrates the type of projects that get funded. These are projects that deliver new techniques in the classroom, new tech-based strategies that advance learning, new tech-based solutions to large undergraduate classes, new tech-based approaches to time-tested theories and models of learning, new methods of using digital materials to advance these same theories, projects that advance the creation of learning centers based on a novel mission. The natural outcome of these funded projects are different types of dissemination and experimentation activities that tend to benefit the department, university, the participating schools and ultimately the community. The department has more sources of funding to recruit and retain faculty, provide

27 A K-16 University collaborative Outreach initiative
28 http://www.coe.ohio-state.edu/edtl/MSAT.htm

assistantships to graduate students and purchase new materials. The department is also able to lavish on various forms of information dissemination form workshops/seminars to online digital library.

Analysis of Current Initiatives

Success of IS and EdTech initiatives in any university may depend on the presence of a vibrant Technology-Based Research atmosphere, presence of Teaching & Learning Centers/Labs which arise out of research or vice-versa and a vigorous and Outreach Activities for disseminating results from field experience and faculty research studies. Each element envigorates the other. For a theoretical example, let's assume a Faculty who experimented on a technology-based teaching strategy using scaffolding techniques for learning using the web or through use of digital manipulatives finds out the effectiveness of the strategy and have his work published in journals and gets more funding to replicate a similar study. While he continues planning the extension of his work, he decides to demonstrate his newly developed research-based teaching technique though a series of seminar/workshops, to a regular audience of teachers and conducted in a fully equipped Teaching and Learning Center. Through a sustained program of theory building supplemented with actual hands-on workshops, this faculty member's teaching method becomes the teacher-participant's newly acquired teaching strategy at the conclusion of the series. Teachers become prepared to implement the skill in their classroom instruction. Several replications of the same strategy applied in a variety of contexts and settings for different age groups generalizes the theory.

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Defining the Next Generation of Librarians

Elise Lewis

Introduction

For years librarians heard technology would no longer make them a necessity. The Internet would make their skill set obsolete. Today, we know nothing could be further from the truth. The library field has evolved into a science, which includes all aspects of information dissemination. Its focus goes beyond the physical walls of the library and utilizes technology to reach virtual visitors. The modern day librarian works across networks bringing a wealth of resources to schools, museums, businesses and communities. Those who study information have changed their titles, updated curriculums and have started working in collaborative environments to meet the information needs of the technology dependent generations.

What's in a Name?

The word librarian has changed in meaning over the past several years. No longer is the word used to describe the old woman, with on bun on her head, telling you to be quiet. The out-dated image has been replaced with a new generation of technologically savvy librarians. The name librarian has evolved with the image, as well. Below are a few names that the field has found more appealing than librarian.

- Information professional
- Information scientist
- Information broker
- Information manager
- Information technologist

Each name listed means something slightly different in each community. However, they all have the same central focus, the flow of information and users.

Evolutions in Curriculum

Changes to universities' Library and Information Science Schools' curriculum has become evident. Masters students no longer practice their handwriting in hopes of creating the perfect card for the card catalog. Technology has greatly impacted what is being taught and has aided in the reinvention of the librarian.

Most schools offering a degree in Library Science offer a degree in Information Science. This degree focuses more on the technology affecting the creation, dissemination and management of information. Students with this degree are highly marketable because they have an understanding of the intricate relationship between technology, information and users.

Table 1 illustrates the evolution of curriculum caused by the integration of technology in information centers and changes in users' expectations of librarians. The course used in the table is part of the required courses needed for graduation. Every student must take it before they can graduate.

Table 1. Changes in curriculum at the School of Library and Information Sciences at UNT

Year	1983-84	1993-94	2003-04
Course Number	SLIS 501	SLIS 5600	SLIS 5600
Course Title	Information Resources and Service	Information and Access Services	Introduction to Information Access and Retrieval
Course Description	Basic principles and techniques of reference and other related information services. Evaluation and use of principle types of information resources. On-line database. Literature searching and synthesis. Bibliographic compilation. Representative problems and practice.	Basic principles and techniques of information services. Evaluation and use of principle types of information resources and services. Electronic database searching, Management of services. Representative research, problems and practice	Epistemological foundation of information use. Basic principles and techniques of information retrieval and access services. Survey of research in information seeking behavior and user interaction. Introduction to systems of access, search and retrieval skills, and collection management. Study of evaluation methods for all formats of resources, services and user satisfaction.

The course taught in 1983-84, relied little on technology. On-line databases were becoming more popular. Users rarely used the web for information-seeking. By 1993-94, more electronic resources were available. Librarians started to see the relationship between services offered and the growing amount of information that could be found on the World Wide Web. Currently, librarians are concerned with meeting users' information needs. The vast amounts of information offer users unlimited resources at their fingertips.

The key objective common to all the variations of the course is evaluation. Regardless of the resource format (print, microfilm, electronic) librarians are taught how to evaluate resources. This skill has increased in importance because of the number of sites on the Web. In 2002, Google reported to have over 3 billion webpages indexed (Poeppe 2002). With so much information, it is no wonder users become overwhelmed or settle for the first bit of information they retrieve. Students are notorious for taking the first results on a Google search and incorporating the information into their research projects. Webpages do not have a system to ensure content has been verified or validated. There are few rules on the Web and even fewer monitoring what is being posted. The ability to evaluate the information and resources has given librarians new creditability in the web environment.

Another important skill librarians are taught is navigating the Web to locate reliable resources. Most librarians will still jump on Google or another web browser for answers to basic questions. For more specialized information, librarians know they need to search databases designed for specific information needs. For example, information regarding health issues is readily available on the web. A person researching a certain disease may be terrified after reading "John Smith's Web Page about Home Remedies." A trained librarian will be able to show the user how to search in a reputable database specifically created for health information. More and more technical databases offer a user-friendly version for those seeking basic information, as opposed to research questions. In most cases, the content of these databases are checked for accuracy and verified.

Collaborations

- Departments

Librarians are no longer restricted to the reference desk or school library. Many librarians are taking jobs in different departments within information centers. Those responsible for technology implementation realize the value of having a librarian involved in the decision-making process. Librarians are gaining respect by acting as liaisons between the technologists and the users. Because they work so closely with the users, both virtual and physical, they have an understanding of their needs.

- Information Centers

Librarians are no longer restricted just to libraries. The term library has changed dramatically over the past decade because of the Web. The activities of libraries are no longer confined to the physical walls, housing books. People are beginning to look to unconventional sources for information. Teachers use the Web for lessons, historians rely on the historical society websites and chemists working in pharmaceutical companies depend on librarians to find the most current and accurate information. Every organization has information needs; librarians and information scientists are being hired to help meet those needs. Below are popular organizations hiring new graduates:

- Libraries
- Schools
- Museums
- Archives
- Cultural Heritages
- Historical Societies
- Pharmaceuticals Companies
- Law Firms
- Technology Companies
- Hospitals
- Zoos

Technology and the Librarian

Almost every job in an information center involves technology. Most librarians realize that keeping aware of current trends and emerging technologies will be beneficial to their workflow. Their daily tasks now incorporate technologies, allowing them to reach virtual visitors. The 2 most evident tasks changed by technology are briefly discussed below.

- Digital Projects

Most everyone agrees that having a presence on the Web is a vital part of an organization. Information centers are no different. Digital projects convert unique materials to a digital format and display them on the Web. A project at Scarsdale High School in Westchester County, New York, exemplifies this type of collaborative project (Berger, 2002). The school librarian worked with an English teacher to create webpages highlighting a particular era of women's clothing and advertisements for the students.

Because digital projects are so prevalent on the Web, resources are readily available to anyone interested in starting such projects. The Library of Congress offers an easy outline of how to start a digital project. The information comes from their experiences creating the American Memory Project (Library of Congress, 2004).

Library and Information Science Schools are starting offer degrees in Digital Imaging. Again, these graduates often find work in non-traditional environments because of their knowledge of images and technology. The University of North Texas is one of the first schools to offer this degree to their graduates.

- Virtual Reference

Librarians have always had a place behind the reference desk. Technology has enabled users to access the librarian without ever leaving their home computer. By using chat software, users can ask their questions and receive immediate responses from the reference librarian. This type of reference service had been slow to catch on but most graduates are trained in conducting reference interviews in an online environment. Once users become familiar with the software, most enjoy having this option.

Conclusion

The librarian's purpose has not been eliminated by technology. Universities are producing graduates that incorporate technology into traditional library tasks. Curriculums reflect the changes necessary for creating modern day librarians. The new skill set makes them attractive employees. Many organizations have hired librarians to handle the flow of information, which is a critical role. Librarians are collaborating with others in new ways to achieve new goals.

It is clear after looking at the capabilities of librarians; technology will not wipe out the field. Instead the technology once feared has actually created a more savvy, flexible and knowledgeable information professional.

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A Semantic Search Engine for a Multimedia e-Learning Tool

Serge Linckels, Christoph Meinel

Department for Theoretical Computer Science and New Applications,
University of Trier, Germany
{linckels, meinel}@TI.uni-trier.de
http://www.Linckels.lu
http://www.informatik.uni-trier.de/~meinel

1 Introduction

At the beginning of the e-learning vogue in the mid 80s, it was said that computer tools, CD-ROMs or online-courses broadcast *via* a network, would replace teachers. Today, practical, pedagogical and financial matters overwhelmed most of these visions. No teacher, no university professor is or will, at least in a near future, be replaced by some cybernetic being or by a simple on-screen show from a CD or the internet. However, the long research on the field of e-learning brought a lot of improvements in education. Although we cannot imagine school classes without a teacher, there are a lot of new methods and tools that teachers and students can use as a complement. Here are two examples:

- No displacement is necessary and no contact with the teacher is needed. Courses are broadcast live or on demand over the Internet. Thus, students can review a missed lesson or an important topic before a test. Also think about all the great contribution this made to distant learning. Anybody can improve his knowledge by subscribing to an "online school" without having to leave his home.
- The teacher has the possibility to promote autonomous learning by using "smart tools". Students play the role of an explorer who discovers new information. They can even create their own course content by assembling the pieces of information they selected. The multimedia aspect and the attractive interfaces draw the student's attention. In general, motivated students are good students, and good students have better results in school.

However, many e-learning tools and solutions are the results of theoretical and scientific research rather than of practical, concrete and founded needs in education. Consider the following two examples:

- A multimedia encyclopedia is a great tool for teachers to find information for preparing their courses. But students can only use few immediately. The information is often presented in too complicated a language and there is simply too much information on one topic. There are no filter techniques to adapt the content to the skills of the user (for example: less information for a kid, exhaustive information for a teacher). Often, search mechanisms are based on simple keyword searches that are not effective, for example: the user gets a large number of possible results.
- A lot of universities offer courses online, often streamed from a server. We will not discuss any performance or financial constraints; each lesson normally takes over an hour that has to be transmitted. Well, let us suppose that the student has a dozen of such lessons to consider for a test. Even if he is searching for precise information, it is difficult and very time consuming to scan through all the possible streams to find the appropriate part.

In our contribution we tried to start from the needs of teachers and students. Founded on the experiences, critiques and wishes of teachers and professors, we formulated the needs listed in table 1.

Table 1. Enumeration of the needs for an e-learning tool of practical use.

For the student:	• Information appears in an attractive form • Answers are short, precise and easy to understand • Large potential of knowledge • Simple and human interaction • Search of information is easy, but effective
For the teacher:	• Restricted and secure information area • Guaranteed quality of information • Easy to administer and to extend (add/remove information) • Easy to access without a lot of specially required equipment and configuration • Motivating for students

2 The multimedia jukebox approach

Our answer to the above listed needs focuses on three key features: the representation of the information in a multimedia form, the splitting of the content into small *clips* and a semantic search mechanism for information retrieval. We firstly published these ideas in [21] and [22].

2.1 The multimedia interface

Today, kids are spoiled with all the wonderful and attractive interfaces of operating systems, applications and games. New software without a graphical user interface in vogue is banned to failure. That's exactly why students prefer websites with colors, images, sound and animations, rather than for example books as learning syllabuses. In fact, isn't it clearer reading something that is illustrated with images, pictures or drawings? Every person is different in his sense of perception. Some understand better if they hear the explanation by the means of verbal communication, some need to write it down, others must see it in the form of a text or a picture and others again have to touch it. A good teaching tool must present the same information in different forms in order to activate as many senses as possible. The psychological foundations were proven by the work of [10] and [11]; *information that is presented at the same time in different forms improves the understanding of the information.*

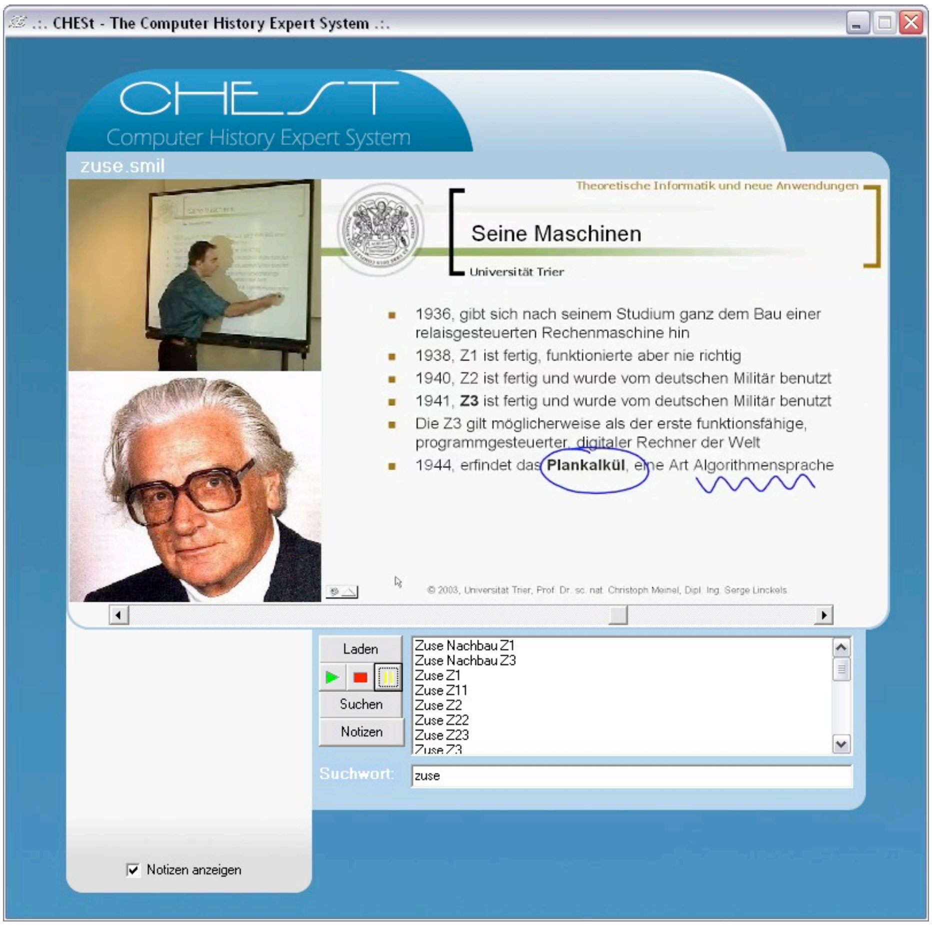


Fig. 1. Screenshot of the prototype *CHESt* with a keyword search on "zuse". The window shows a list of search results in the bottom right-hand corner. Selecting a topic from this list will play the clip, like the one shown in this example, where the teacher uses an interactive board. Added handwritten comments made by the teacher are integrated and applied in real time on the text (top right-hand window).

The interface of our tool is basically organized in three windows (see figure 1). The **first window** (video and audio) shows a teacher explaining something on the whiteboard. This is the student's common view in a classroom and should create a kind of "virtual classroom" atmosphere. Based on practical teaching experience we can confirm that students often take lessons where they use a new computer tool or do research on the web

for example, as a kind of game, without relation to the "normal" lessons. The video sequence should keep them concentrated on what they do and draw their attention to what the teacher is explaining.

The **second window** represents the usual blackboard. It is in fact a zoom on the whiteboard that the teacher uses in the video (first window). Although the blackboard is the most used medium in schools, it has a lot of disadvantages, for example:

- It is impossible to represent pictures.
- It is difficult and time-consuming for the teacher to create a complex drawing.
- It is time-consuming for students to reproduce its content in their books.
- The content is not available for later lessons and must be reproduced.

The virtual blackboard in our tool has the following features:

- The teacher can use this area for an on-screen presentation (for example: *PowerPoint)*.
- He can add handwritten information to the *smartboard*, which is reproduced in this window both simultaneously and in exactly the same way.
- He can also display the desktop of his connected laptop, for example in order to explain a certain application, to show a website or to demonstrate the settings of the computer.

The **third window** can be used for any purpose. It can contain links to a photo gallery, hyperlinks to additional information on the web, book references or just a single picture of the subject the teacher is speaking about.

We used *Tele-TASK* [3] [9] [12] [13] to record the lessons in order to create one well-structured multimedia stream. The result is a *RealMedia* file that can be played with any compatible software, for example the free *RealOne Player* [6].

2.2 The clip approach

Essential in our concept is the length of the stored items in the knowledge base; the duration of the video sequences. The younger the user, the shorter the time during which he/she will concentrate on the information displayed on the screen. Furthermore, we mentioned already in the introduction that it is not easy to find the appropriate information inside a large piece of data, for example an online lesson that lasts 90 minutes. Jules Cesar already said: "Divide to reign". Therefore, we divided all our multimedia data into small *clips*. The duration of each clip varies from several seconds to 3 or 4 minutes. Each clip documents one subject or a part of a subject. Together, all the clips of the knowledge base cover one large topic. In our prototype CHESt (*Computer History Expert System*), we focused on one precise topic: computer history. We produced 300 clips about every important event in computer history. CHESt exists as standalone application (we managed to store the whole knowledge base with the application software on one single CD-ROM) and as online application that can be found at [7]. The later uses a streaming server to transmit the clips to the user's browser.

Splitting a large topic like computer history into a lot of small pieces is much easier than we assumed at the beginning. We are now convinced that most courses taught in schools or at universities can be divided into smaller *atomic units* where each covers one precise subject. Teachers of different fields confirmed that this concept is not limited to computer-science and that it could be used in their field too. For instance, in language courses, a teacher could record one clip per grammatical rule. Another concrete test was made in the field of biology where a teacher used our tool to explain the basic function of the heart. Further details would be explained in additional clips.

One more advantage of that clip-approach is the simplicity of administration. If the tool does not cover a certain topic, a new clip can be recorded and added to the knowledge base. The intervention of a computer-science expert is not necessary.

2.3 Finding the right clip

Having a large knowledge base with short multimedia clips is one thing; another thing is to find the right clip. The more clips you have, the better your knowledge base covers a certain topic, but the more difficult it is to find an appropriated clip. A first solution is of course to let the user browse through a table of content where all the clips are listed in categories, for example: *hardware/storing devices* or *people/still living*, etc. and load the chosen clip. This possibility is offered in the standalone version of our tool, not in the online version for the moment. The main disadvantage is that there is no additional information about the content of the clip except for a short designation. Furthermore, this operation is time-consuming and not very effective, because the user has to search and maybe test different clips before he finds the answer. An automated search would be better. At the moment, the prototype CHESt has only a keyword search. If the user enters "arpa", the system will list all clips about the ARPA and the ARPANET. The user then selects a clip from that list to be played.

The main disadvantage is that the user must already give a part of the answer. For example, you want to know who invented the first computer. Then you should enter keywords like "Zuse" or "Aiken". You cannot ask: "Who invented the computer?" Another problem is that, depending on the keyword, you will get a long list of possible results. Finally, even if a clip is about a certain topic, it must not necessarily be found from the keyword the user has entered, for example the user enters "disk" but the matching keyword would be "floppy".

The most efficient search mechanism is to allow the user to enter a complete question. The tool should "understand" that question and give a small list of pertinent clips as answer, or better even just one clip. Technical details about a *semantic search engine* are described in section 3. This solution is also pedagogically welcomed because in schools, students are forced to express themselves in complete sentences and not just with keywords. Most important is the fact that the interaction between the student and the tool takes place in a very human and simple way. An imaginable improvement would be a verbal communication where the user could speak his question into a microphone.

2.4 Example of an all day application of CHESt

With the features described bellow, we could imagine that the student who is working with CHESt has his own *virtual teacher*. This teacher's answers are short and presented in an interesting multimedia form. The student can communicate with him in a very simple and human way by typing his question, or in a later improved version by means of verbal communication. As every tool and method, CHESt will not replace every conventional lesson. We see it as a complement useful for certain occasions. It's up to the "real" teacher to decide, for which of his lessons it is appropriated, for example:

- To introduce a new subject by letting the students discover themselves some new information.
- To use CHESt as complement to find illustrations for a certain topic (for examples pictures of old computers or computer pioneers).

The students could work in groups or alone. In fact, they create their own course content: the clips they consult. Depending on the kind of work, they can print a certain scene of a clip, copy snapshots into a text document or simply take notes. The teacher is sure that the information they get is correct and secure. Here a concrete scenario: "*Hi students. Today we are working on computer history. Here is a list of interesting questions. You have 40 minutes to search for information before we discuss your answers together. Of course, use CHESt!*".

- *Who invented the computer? When?*
- *What is the Colossus?*
- *What is a transistor useful for?*
- *Explain the word FTP.*
- *Who sent the first e-Mail?*
- *What was the size of the first hard disk?*
- *Who invented Unix?*
- …

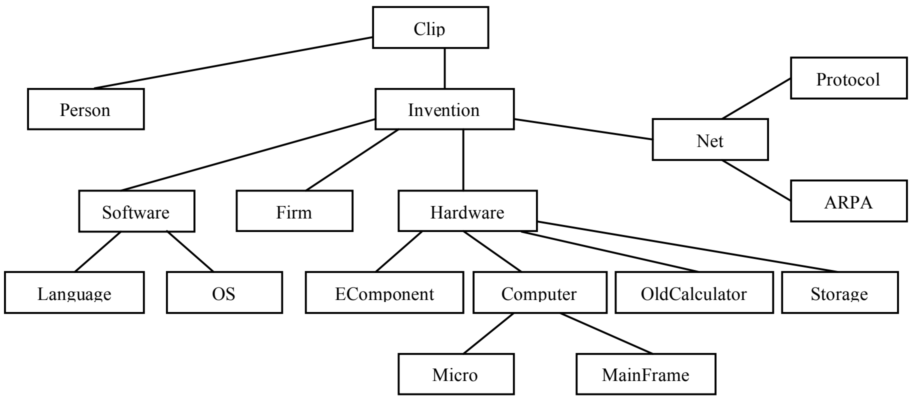
3 Describing the meaning of the clips

In section 2, we described our prototype CHESt from a pedagogical view. The search of a certain clip, not by keywords, but by a freely formulated question is one of the main necessary improvements. Though, before the tool can even try to understand the user's question, it has to "know" what data are stored in the knowledge base. In other words, every clip must be described in a machine-readable form. Therefore, we have to add data to each clip to describe its meaning. That kind of data is called metadata. For this purpose we use the *Resource Description Framework* (RDF), introduced by the W3C in 1998 to build the Semantic Web [16]. In principle, this is done once, at the moment when the clip is added to the knowledge base. However, the computer can assume a part of this task. The different steps are described below.

3.1 The CHESt RDF vocabulary

With our concept to use short clips, we have the great advantage that we can describe the meaning of one clip with few metadata. We divided the CHESt knowledge base logically into two classes: clips that describe inventions (things) and clips that describe inventors (persons). Assertion: an invention was invented by one or more inventors. An invention and an inventor can be a *resource* (in our case: a clip) or a value (just a textual information). Every resource is described with properties. An **inventor** has three properties (*predicates*): his name (`vCard:FN`), the year of his birth (`chest:year_birth`) and the year of his death (`chest:year_death`); if still alive, this property is left blank. As you see, we used the W3C recommendation v*Card* namespace property *full name* (FN) [15]. The class **invention** is divided into a number of subclasses to better organize the different resources (see figure 2). We used the *Dublin Core* (dc) namespace [4] to describe an invention with the following properties (*predicates*): its description (`dc:title`), its date of first appearance (`dc:date`) and its creator (`dc:creator`). The complete CHESt RDF schema can be found at [8]. With these few elements we can semantically describe every clip.

Fig. 2. Class hierarchy of the CHESt RDF classes



3.2 Generating the CHESt dictionary

The next step is to search inside every clip for metadata. For example, the clip, which describes the calculator "ENIAC" should be scanned to find its description, the year where it was first taken into service, and the name(s) of its creator(s). We tried to apply an approved approach in the field of computer linguistics: create a dictionary of synonyms for every CHESt RDF element [5] [14]; in one column one will find the RDF elements and in the other column there is a list of natural language synonyms. For example, if we are scanning for `dc:creator`, we are searching for words like *creator*, *builder*, *constructor*, *inventor*, etc. For our prototype, we decided to consider only the textual data from the PowerPoint presentations and to ignore the teacher's audio information and his handwritten notes for example. With a special tool [17] we are able to convert the PowerPoint documents into pure text files. Then the *stemming process* can begin. All non-words (words that contain digits or special characters) and words with just one letter were eliminated from the generated text files because they have no semantic influence. All words are converted into lowercase and special characters are replaced by a space. Finally a list of 20640 remaining words was created from the whole 300 clips in the knowledge base. All were represented in a tree, where every node represents one letter. The tree is built in less than a second. The words are read vertically from the top (root) down along the branches (see figure 3). This technique also allows to eliminate all double words. Each node contains the number of words that end with that particular letter. There are 4215 remaining unique words with an average length of 8.049 letters per word.

The dictionary of synonyms is built from that tree. The idea is to regroup words with similar spelling and thus with the same meaning (for example: build, built, builds). It is impossible to detect automatically all synonyms, because there are words that have a similar spelling, but not the same meaning (for example: consult, consume). The aim of the stemming process is to limit human intervention by proposing clusters of generated synonyms. Further details of this process are described in [22].

Why didn't we use an existing dictionary of synonyms, for example GermaNet [20]? For two reasons: first, by choosing an existing dictionary, CHESt would immediately be set to a certain language (English, German, French…). Our solution is language independent, because it builds its dictionary from an existing content. Second, even if we still have 4215 unique words to scan for synonyms and RDF elements, it is still much less

than a complete dictionary with at least 200 times more words. Note also, that the words listed in our dictionary are words that are used at least one time.

3.3 Generating the RDF description

The final step consists in scanning through the clips (as text files) and searching for synonyms for the RDF elements described in section 3.1. In our case 273 out of the 300 clips were described automatically and without human interaction. In some clips, different concurrent synonyms were found. The most frequent example is the RDF synonym for `dc:date` which represents the date of first public appearance of an invention. For different inventions, there was a date of planning, a date of starting the construction and a date of launch. To solve this ambiguous problem, we programmed our tool so that, in case of concurrence, it chooses the second occurrence and protocols the problem in a log file. The final result is an RDF/XML serialization for each clip (see figure 4). We used Jena [18] to generate the RDF serialization. Jena allows to store de triples in a simple XML-file but it also supports several RDMS (for example MySQL or PostgreSQL).

```
<?xml version="1.0"?>
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dc="http://www.w3.org/2001/vcard-rdf/3.0#"
  xmlns:chest="http://www.linckels.lu/chest/elements/1.0/">
  <chest:Person rdf:about="http://sigma957.lte.lu:8080/ramgen
                                            /Archive/Zuse.rm">
     <vCard:FN>Konrad Zuse</vCard:FN>
     <chest:year_birth>1910</chest:year_birth>
     <chest:year_death>1995</chest:year_death>
  </chest:Person>
</rdf:RDF>
```

Fig. 4. Example of a semantic description of a clip using RDF/XML and streaming access to the multimedia files. The clip is about the person "Konrad Zuse".

4 Understanding the user

The number of results (in CHESt a matching result is a clip) will be shorter and more pertinent with a semantic search than with a normal keyword search. Furthermore, the user must not enter a part of the answer in its question, for example: “Who invented the first computer” doesn’t contain the name of the inventor. In fact, the name of the inventor is the information to find.

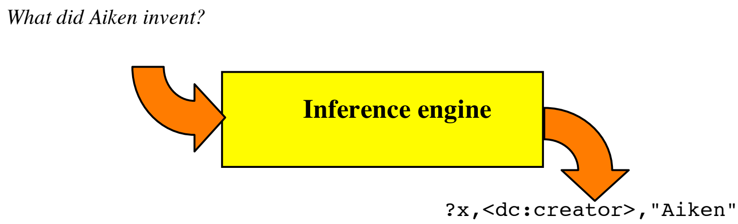


Fig. 5. Principle of the inference engine, that transforms a non-formula question into a well-formulated RDF query.

We now dispose of a well-formulated and semantically described knowledge base in RDF (see section 3). To perform a semantic search, the question entered by the user must be transformed into RDF too, in order to have the same structure for the question and for the database. The backbone of our semantic search is an inference engine which transforms a normal sentence (the user’s question) into a well-formulated RDF query. We used RDQL to access our RDF knowledge base [23]. See [1] [2] [19] for more details about semantic databases. For example: “What did Aiken invent?” should become:

```
select ?x WHERE (?x,<dc:creator>;"Aiken").
```

As described in section 3.2, all the words in the dictionary are basically regrouped in two categories: words that are of any semantic use (which are associated with an RDF element) and words without semantic use (which are not associated with an RDF element). It is clear that this dictionary can only be used in a precise context, which is computer history in our case. The user's question is also put in that same context for parsing,

for example if the users asks "Who invented the penicillin?" the tool cannot give an answer because the question is outside the tool's context. Starting with these constraints, the transformation of a common formulated sentence into RDF can be resumed by saying that the system has to replace all semantically important words by the RDF corresponding elements and to throw unimportant words away. Of course, the shorter the questions, the better the results.

Since all RDF elements in the CHESt schema are defined either as {subject, object} or as {predicate} (see section 3.1), there is no doubt about the membership of the recognized RDF elements. Except `chest:Person` and `chest:Invention` (or one of its subclasses), all RDF elements are predicates (see figure 2). As we are dealing with questions, there should always be a missing part, normally the subject or the object. Remember the basic assertion: "An invention was invented by an inventor". Generally, members of the class `chest:Person` are objects, members of the class `chest:Invention` are subjects.

4 Conclusion and Outlook

Our primary aim is to create a tool or even a new method of teaching. The teacher is in the background and the student plays the role of an explorer. Therefore, it motivates the student because (s)he can create his own course content. The information is presented in an interesting multimedia form. The system 'understands' the questions of the user and gives efficient answers: there are no long searches for answers, but the requested answers are rendered in a concise form. Of course, a motivated student is a good student and good students normally achieve better results. Thus, this tool is supposed to improve education.

The prototype CHESt covers the field of computer history, but by generalizing the knowledge base, it can be used in nearly every course in any school, college or university. Its advantages are that it promotes independent learning. By adding other clips from other fields (for example: biology, electronics, etc.), CHESt could become more than just an expert system on computer history. Ideas are to use external and existing resources of information, rather than to record new clips for each subject. Another idea is to test how a RDF vocabulary can be associated automatically with an existing dictionary.

The prototype CHESt is tested with a simple keyword search in some selected schools in the summer term of the year 2004. We hope that the collected data will give us a first impression of the reaction of teachers and students with that new tool.

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"Having access to other teachers' brains!" A Professional Development Online Community of Practice for Texas Reading Teachers

Mark Luetzelschwab
Edvance
Austin, TX
mluetzelschwab@edvance.org

Courtney Glazer
University of Texas Center for Reading and Language Arts
Austin, Texas

Tim Yuen
University of Texas Center for Reading and Language Arts
Austin, Texas

Abstract:
Online Teacher Reading Academies (OTRA) and Reading Teachers Talking Together (RT3) represent innovative uses of technology for teacher professional development aimed at K-3 reading teachers in Texas. OTRAs are hybrid CD ROMs which focus on content and teacher-to-trainer interactions. RT3, an online community, serves as ongoing support by focusing on the practice of teaching reading through teacher-to-teacher interaction based on OTRA content. Together these products represent a shift away from traditional teacher professional development.

Overview

Online Teacher Reading Academies (OTRA) and Reading Teachers Talking Together (RT3) represent innovative uses of technology for teacher professional development aimed at K-3 reading teachers in Texas. OTRAs are hybrid CD ROMs which focus on content and teacher-to-trainer interactions. RT3, an online community, serves as ongoing support by focusing on the practice of teaching reading through teacher-to-teacher interaction based on OTRA content.

Historical & Theoretical Perspective

Online Teacher Reading Academies (OTRAs) are electronic adaptations of the face-to-face Teacher Reading Academies developed by The University of Texas Center for Reading and Language Arts (UTCRLA). These face-to-face Academies ran from 1999-2001 and consisted of 24 hours of training for each grade level at central locations with participants receiving large binders of information. Because these face-to-face trainings were time intensive and costly, the UTCRLA empowered their Technology

Team to develop an alternative method for delivery of the Teacher Reading Academy content.

In developing OTRA and Reading Teachers Talking Together (RT3), the Technology Team had the opportunity to draw on new pedagogies for teacher professional development. As a result, these products represent a shift from the more traditional, with topics prescribed for teachers (e.g. Dillon-Peterson, 1986), a focus on interventions for existing problem areas (e.g. Schlager & Fusco, 2003), content being delivered by outside experts (e.g. Dillon-Peterson, 1986), teachers playing a passive role (e.g. Scribner, 1999), and the promotion of privacy and autonomy (e.g. Schlager & Fusco, 2003). Instead, OTRA and RT3 rely on learner-centered pedagogy by drawing on online communities of practice (Lave & Wenger, 1991), knowledge building and sharing (Barab, MaKinster, Moore, Cunningham, & 2001), and collaborative interactions (e.g. Scribner, 1999).

Researchers looking at teacher professional development have found that such a shift is vital in order for the learning to be effective (e.g. Rudestam & Schoenholtz-Read, 2002; Stein, Smith, & Silver, 1999). Teachers must be allowed to take responsibility for assessing and meeting their own learning needs (Dillon-Peterson, 1986). One way of ensuring this is by shifting teacher professional development to being built on the theory of situated learning via communities of practice (Lave & Wenger, 1991). In communities of practice, teachers are able to connect their learning directly to the practice in which they are engaged in the classroom as well as meet their changing needs as they move across the career ladder (Schlager & Fusco, 2003). Also, teachers who are engaged in a community of practice have the freedom to choose varying levels of participation according to their needs (Lave & Wenger, 1991).

Hiltz and Turoff (2002) point to interactivity as a marker for the effectiveness of learning communities. They call for interactivity between the student and instructor, among members of a class, and between the students and the technology used. While their focus was online classes, their work can be applied to any online community of learners. OTRA and RT3 provide for each of these levels of interactivity in order for teachers to have the most effective professional development experience. Instead of interactivity between student and instructor, OTRA participants engage in interactions between teacher and subject matter expert and, in RT3, between teacher and online facilitator. In the Internet-enhanced OTRA, participants can vicariously interact with one another through a question and answer feature, while in RT3, participants interact directly with one another. Finally, in both environments, teachers interact with the technology and, most importantly, the knowledge that can be found therein.

Technology Design

Each OTRA is a hybrid CD, meaning that the teachers can use it as a stand-alone program, or they can use the CD while connected to the Internet. In either case, teachers can listen to a narrative presentation, participate in interactive activities, and observe other's classrooms via video demonstrations. When connected to the Internet, teachers have the added capabilities of keeping their own notes and bookmarks,

tracking their progress while working through the Academy instruction, and engaging in "Q&A" with Teacher Reading Academy trainers. At any time, teachers can pose a question to an expert trainer. Participant questions are routed to a central server and placed in a queue to be merged with other similar questions and responded to by OTRA trainers. These trainers are experienced classroom teachers who served previously as trainers for the face-to-face version have been specially trained to respond to teacher questions in this online format. All questions are answered in 24-48 hours and responses that are not "private" are posted to the Internet so that participants who are online can see them.

RT3, an online community of Texas K-3 reading educators, serves as ongoing support for the teachers. RT3 was designed as a safe space where teachers can talk freely with other teachers. Thus, only K-3 reading educators are allowed to participate. RT3 encourages teacher-to-teacher communication, community building, and problem solving while maintaining guidance and support. In RT3, teachers share advice, ask questions, collaboratively build lesson plans, and search through a library of materials, including the OTRA content. This ever-growing collection of information is an invaluable resource for both new and experienced teachers. RT3 is staffed by facilitators—educators who have been specially trained in online facilitation techniques in order to help participants have the best experiences possible. These facilitators were many different hats, among them discussion leader, content harvester, and expert locator.

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Innovative Technology Use in Live Counselor Supervision

Kenneth L. Miller, Ph.D.
Youngstown State University
Youngstown, OH

Susan M. Miller, Ph.D.
Temple University
Philadelphia, PA

William J. Evans, Ph.D.
Westminster College
New Wilmington, PA

Faculty in the Department of Counseling at Youngstown State University (YSU) have adopted two innovative technologies for training future counselors: Bug-in-the eye (BITE) and Audio-Track Overlay Package (ATOP). These technologies are used at the YSU Community Counseling Clinic to train graduate counseling students in the delivery of counseling services. The first opportunity for counselors-in-training to provide clinical services to clients is during a counseling practicum course that is offered at the Community Counseling Clinic. Each counseling session is monitored by a supervisor-in-training as well as by clinical faculty. The role of clinical supervisors is to ensure client safety and the delivery of appropriate clinical services by observing counselors' delivery of services and providing feedback for improvement. In order to achieve these objectives, clinical supervisors provide feedback to the counselor both during the session (*live supervision*) and after the session (*post supervision*).

During the past two decades, new technologies and new uses for existing technologies have dramatically increased communication capabilities between supervisors and counselors. Technologies used to provide clinical supervision should be easy to use so that both supervisors and counselors are comfortable using them. Additionally, such technologies should be effective and efficient in facilitating communications from supervisors to counselors and should not intrude upon or disrupt the counseling process. If used for live supervision purposes, technologies must have the capability to provide instantaneous rather than delayed feedback. With these criteria in mind, Bug-in-the eye (BITE) and Audio-Track Overlay Package (ATOP) were integrated into the first counseling practicum at the YSU Community Counseling Clinic for supervision of counselors-in-training. BITE technology is used for live counselor supervision; ATOP is used for post supervision.

Technology for Live Supervision

Bug-In-The-Eye (BITE; Klitzke & Lombardo, 1991) technology is one of the latest technology systems used to facilitate communication from the supervisor to the counselor during live supervision. BITE technology requires a computer and monitor at a supervisor's station to be connected to a monitor in the counseling room. The counseling room monitor is positioned so that the screen is visible only by the counselor. At YSU, a computer monitor in each counseling room is connected to a dedicated computer located at a supervisor's workstation in a supervision "Control Room."

In addition to the dedicated computer at each supervisor's station, each station is also equipped with a video monitor. Each counseling room is equipped with a video camera that provides a live feed to the video monitor at the corresponding supervisor's workstation. While viewing a counseling session on the video monitor, a supervisor uses the computer to provide instantaneous directives and feedback to the counselor that are displayed on the computer monitor in the counseling room. For example, the supervisor can type messages such as "Explore the client's rationale for the decision to leave his wife," "Ask the client how frequently she drinks," or "Nice job of reflecting the client's feelings of depression." The counselor then reads and integrates the supervisor's feedback into the counseling process. After observing that the counselor has received the message, the supervisor uses a combination of keystrokes to return the message to her/his computer monitor, which causes the counselor's monitor to go blank. The supervisor continues observing the session until making the next supervisory intervention.

Another format for communicating supervisory feedback is the icon (Tracy et al., 1995). Icons are shorthand for frequently used supervisory directives. For example, a supervisor can direct a counselor to focus on a client's emotions by displaying an icon of a beating heart. The use of icons requires that both supervisors and counselors be trained to facilitate immediate interpretations.

Digital communication devices other than full size computers and monitors can be used to provide live supervision. Text and/or icon messages can be communicated using an alphanumeric pager, a digital telephone, or a personal digital assistant. One disadvantage of these devices is the degree to which they intrude upon the counseling process. Because of their small size, these devices must be held by the counselor. The small monitor size of these devices also makes it difficult to read messages. Other disadvantages include the costs of obtaining a wireless service provider and problems with making infrared connections between the counseling room and supervisor "Control Room." Counseling faculty and students at YSU piloted these technologies in simulated counseling sessions prior to selecting BITE as the technology of choice.

Traditional live supervision methods such as such as *knock on the door, telephone call-in*, and *bug-in-the-ear* either disrupt or intrude upon the counseling process. Using a knock on the door, a supervisor disrupts the counseling session to meet with the counselor or to intervene directly in the session. A telephone call-in requires the supervisor to phone the counselor via a telephone in the counseling room. Bug-in-the ear technology, which consists of a microphone at the supervisor's station and a receiver worn in the counselor's ear, is less visibly intrusive for the client. However, as the counselor does not control when a supervisory message is received, bug-in-the ear technology is disruptive to the counselor's cognitions, and ultimately to the counseling process.

BITE technology offers several advantages over the above methods for live supervision. It is both less intrusive upon and disruptive of the counseling session. Once a supervisory message is displayed on the computer monitor, the counselor can control when to view the message. Rather than being interrupted in the middle of a sentence by a

knock on the door or a ringing telephone, BITE technology permits a counselor to view and respond to supervisory feedback in a manner that appears seamless to the client. Being able to easily receive and integrate supervisory feedback without distractions can influence the delivery of clinical services (Klitzke & Lombardo, 1991). BITE technology permits more precise and flexible timing in the delivery of feedback or directives. With the ability to communicate instantaneously, supervisors are able to concentrate on issues of immediate concern (e.g., "Determine if the client has a suicide plan…means…motive…location…time") or consider more global issues after monitoring the a portion of the session (e.g., "Client is avoiding talking about the PATTERN of his dysfunctional relationships.").

Evaluation of Bug-in-the-Eye technology at Youngstown State University was conducted with a convenience sample of counselors-in-training who used BITE during their first counseling practicum. Students also used bug-in-the-ear technology during this practicum. These students reported that: (1) they were comfortable using BITE; (2) the use of BITE did not negatively affect clients; (3) BITE technology was a helpful and effective learning tool; (4) BITE increased their confidence in providing counseling services, and (5) the immediate feedback from BITE made it easier for them to correct mistakes and improve their effectiveness as a counselor. Students further reported a preference for BITE over bug-in-the-ear supervision.

Research on BITE technology is sparse. Before this technology can be widely adopted, several questions must be answered. Future research should be conducted regarding the most efficient message format (e.g., text vs. iconographic) as well as the type of message content (e.g., directives vs. support). In addition, researchers should examine message length and frequency to determine optimum parameters. Concurrent with the study of technology variables, researchers should also examine the conditions (e.g., settings, counselor style, client variables) under which BITE technology is most effective.

Technology for Post Supervision

At Youngstown State University, Audio-Track Overlay Package (ATOP) technology has been introduced to improve the delivery of post supervision. The goal of post supervision is to provide supervisory feedback so that the counselor can reflect upon and analyze clinical strengths and weaknesses.

At previously noted, each counseling room at YSU is equipped with a wall-mounted video camera that is connected to a video cassette recorder (VCR) located in the supervision "Control Room." An omnidirectional microphone in the counseling room is connected through a sound mixing board located in the control room to the same VCR. Additionally, a unidirectional microphone installed at each supervision station is connected through the sound board to the same VCR. During live counseling sessions, supervisors use ATOP technology to record a second audio track onto the videotaped counseling session. ATOP enables supervisors to simultaneously record feedback,

comments, suggestions, and reflections in real time. Following counseling sessions, supervisees review the videotaped counseling session and hear both the session content and the supervisor's feedback.

The traditional method for post supervision is making audio or audio/video recordings without opportunities for supervisors to provide real time feedback and analysis. Supervisors take written notes and review them in providing feedback during a post session supervisory session.

There are several advantages of ATOP technology for both supervisors and supervisees. By providing feedback in real time, supervisors are able to provide more focused analyses of counselors' skills. Audio communications can also yield more comprehensive supervisory feedback than written notes. Real-time commentary reduces reliance on memory during post session reviews with counselor trainees. There are also advantages for supervisees. After a counseling session, they can review the ATOP recordings on their own time, but prior to meeting with their supervisor. They can re-play segments to reflect on the supervisor's feedback and to critically analyze specific and more global clinical skills.

Table 1 shows a comparison of supervision approaches in the context of problems associated with each approach. The left column lists problems while ratings in each cell identify the degree of the problem (i.e., Low, Moderate, High) associated with each problem by approach. This information can be used to determine optimal supervision approaches given the unique needs and goals (e.g., need for low intrusion on counseling process, unavailability of funds with which to purchase different technologies) of clinical training sites. Bug-in-the-Eye for live supervision and ATOP for post supervision appear to be the most advantageous systems, given the availability of adequate funds.

Table 1: Supervision Methods and Degree of Problems Associated with Each Method

	Live Supervision Methods				Post Supervision Methods	
PROBLEM	KNOCK	PHONE	BUG-IN-THE-EAR	BUG-IN-THE-EYE	A/V Tape	ATOP
Discomfort	Low	Low	High	Low	Low	Low
Intrusive	High	Moderate	Moderate	Low	Low	Low
Disruptive	High	Moderate	High	Low	Low	Low
Timing of Feedback	High	Low	Low	Low	High	Low
Inflexible	High	Low	Low	Low	Moderate	Low
Inefficient	High	Low	Low	Low	Low	Low
Expensive	Low	Moderate	Low-High	Low-High	Low	Moderate

Technology for Supervision – The Future

The ubiquitous nature of the Internet suggests that web-based supervision may be on the horizon. There are apparent advantages to this approach. Supervisors may observe a live counseling session at a remote location and provide immediate feedback. Multiple users could log on at the same time (via a password), so that a session could be observed by more that one supervisor. Instead of traveling across town or across the state, a supervisors could view a session from the comfort and convenience of their offices. Eliminating travel time is a significant cost saving for most institutions. Sessions could be digitally recorded for post supervision with trainees. Although Internet technology has the potential to provide these advantages, it poses serious potential risks. A cornerstone of the counseling profession is the assurance of confidentiality between a counselor/supervisor and client (limited by legal considerations). Web-based supervision has the potential to breach this confidentiality through unauthorized access to a live counseling session. Supervising at a distance poses additional problems of inadequate development of supervisor/supervisee relationship and lack of immediate supervisor availability in the event of an emergency. Ongoing research and the development of technology use standards in professional codes of ethics are needed to address these concerns.

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THE SCHOOLS TECHNOLOGY BUILT: STUDENT SATISFACTION AND ACHIEVEMENT IN A VIRTUAL HGH SCHOOL

Steven C. Mills
The University of Kansas

ABSTRACT

A study of over 2600 online student enrollments in a virtual high school was conducted. This study found that online courses for high school students provided a realistic and affordable solution for limitations in the curriculum of many secondary schools. Students who completed an online course were generally satisfied with the course and course instructor and were usually as successful in the course as they were in their regular high school courses.

INTRODUCTION

The tremendous growth and expansion of the Internet was an important development in the advancement of delivery methods for distance education courses and in changing the definition of distance education. In the past, distance education was comprised of courses where the instructor and learner were separated by location but not by time. With Internet-based distance education, a high degree of interactivity is encouraged among geographically separated learners. Learning is independent of time or place, using computer and communications technologies to work with remote learning resources, mentors, experts, and other learners, but without the requirement to be online at the same time (Staley & MacKenzie, 2000). Asynchronous group and individual messaging, as well as access to course materials and interactive realtime events, form the foundation for what constitutes online distance education today (O'Brien, 2001).

The Kirkpatrick (1994) four-level model of training evaluation shaped the research questions used for this multifaceted evaluation. The Kirkpatrick model consists of these four components: (1) Reaction—Were learners satisfied with the online courses? 2) Learning—Did learners' skills or knowledge increase or improve? (3) Behavior—Did learners apply skills and knowledge from online courses? (4) Results—Did online courses achieve desired outcomes of the school and do so cost-effectively?

This study examined K-12 online learning by asking and attempting to answer the following evaluation questions:

- Who enrolls in K-12 online learning courses, in what courses do they enroll, and why do they enroll for these courses?
- Is the achievement of students in teacher-directed online courses equal to or greater than their achievement in teacher-directed courses in high school classrooms?
- How are K-12 online courses implemented by students and teachers?
- What are the advantages and disadvantages of K-12 online learning?

METHODOLOGY

Overview and Description of the Virtual High School

The subject of this evaluation was a virtual high school operated by an education services cooperative in a midwestern state in the United States. This organizational model of this virtual high school was through coordination with local school district. The virtual high school trained and provided instructors, organized recruitment and registration processes, and maintained a Web site. Credit for virtual high school courses came from the individual schools. The virtual high school targeted school districts with a need for building educational capacity through the delivery of online courses that expand

curriculum offerings, eliminate scheduling conflicts, address teacher shortages, and cost-effectively enable a school district to extend learning opportunities. Courses offered by the virtual high school included some it developed as well as many courses *brokered* from content providers. Each course provided by the virtual high school was extensively evaluated utilizing a validation rubric so that it can be integrated into a district curriculum.

Effective partnerships with online content providers were an important factor for the success of this virtual high school. For this study, 86% of student enrollments were in courses provided by Class.com; 5% were in courses provided by Apex Learning; 3% were in courses provided by Cyberschool; and 6% were in courses developed by the virtual high school.

Role of Teachers in Online Courses

All the online courses had a teacher designated for the course and were more or less teacher-directed. Teachers were paid based on the number of students that enrolled in their course. Teachers received a contract on a new enrollee once the student had cleared the 14-day period in which it was possible to drop a course and receive a refund. There was no imposed minimum or limit on the number of students a teacher had in a course. For the period of time covered by this evaluation, the average course size was 122 students, although actual course sizes varied considerably from as few as 5 students to over 250 students.

Teachers were expected to contact new enrollees by email as they enrolled in a course to provide some information about the teacher along with the expectations the teacher had for student progress in the course. Teachers were required to publish office hours that they are available to provide immediate assistance to students and were required to be available for a minimum of one hour, one day per week. Teachers were expected to check email accounts and discussion boards daily and to update grades daily. Grades were assigned using a percent basis, permitting the local school district to grant the credit and assign the letter grade.

Role of Students in Online Courses

The virtual high school provided online courses that allow students to take online courses for high school credit for transfer to a local school district. Students enrolled in online courses were expected to abide by the virtual high school's Acceptable Use Policy (AUP). Upon enrollment students were required to sign a Student Contract, indicating they would comply with the AUP. The Student Contract also established procedures for removal from a course in the case of non-compliance with the AUP.

Students had six months to complete a .5 unit of credit course and twelve months to complete a 1.0 unit of credit course. Completion time for a course was calculated from the date the student enrolled in an online course. A student could complete a course, however, in as few as 30 days. In its analysis of course completions, this evaluation did not distinguish between half credit and full credit courses nor did it attempt to analyze course completion and achievement by curricular subject or theme.

Study Sample and Analysis Methods

The primary unit of evaluation and analyses for this study was student enrollments (N=2601) in online high school courses. The count of course enrollments was not unduplicated, and so most analyses computed cases based on students in each online course in which they enrolled and not as individual students. From the total, student enrollment frequency counts were used to derive descriptive statistics for the study sample. To examine student performance and achievement in online high school courses, a cohort of course completers was extracted from the enrollment database. The course completers cohort (N=702) consisted of all student enrollments who completed a course prior to the commencement of the data collection for this study.

To evaluate student perceptions of course quality and delivery, students completing an online course were requested to complete an online course evaluation. Valid and usable forms from 310 student evaluations were examined. Student evaluation forms, like enrollment records, were not unduplicated and so the analyses computed cases based on valid, completed forms and not as individual students.

To compare student achievement in school with achievement in online courses, student cases were randomly selected from the course completers cohort. Letters and forms were mailed to the parents/guardians of the randomly selected completers. Using this random selection process, permission forms from parents and grade records from schools were obtained for only 27 students (including 1 home school student). Because the response to this solicitation did not provide a large enough sample for analysis, school districts with substantial enrollments in the virtual high school were invited to provide transcript and standardized test score information for students enrolled in online courses. Transcript and test score information was obtained for an additional 40 students to bring the total to 67 student cases with both online course grades and school achievement records.

DATA ANALYSIS

High School Student Attitudes about Online Learning

One component of the evaluation process consisted of collecting feedback from students concerning their attitudes about taking online courses. An online student evaluation form was developed to collect these data. The online form permitted the virtual high school students to complete an online evaluation by linking to the form once they completed their course. Of the students who completed an online evaluation form, 60% were female and 37% were male (3% not disclosed). The grade level of students taking an online course was widely distributed across high school grade levels: 31% were seniors, 28% were juniors, 26% were sophomores, 11% were freshman, and 5% were 7^{th} or 8^{th} graders. Most students (82%) completing an online evaluation form reported they had never taken on online course before. Most students who evaluated an online course accessed the course from school (71%) or from home (26%) and 87% owned a home computer. Most students self-reported that they made above average grades in school with 46% of the students reporting mostly A's in school, 29% mostly B's, 17% mostly C's, and less than 4% with mostly D's or F's and less the 4% not disclosed.

Students were asked why they took an online high school course (see Figure 1). Students often enrolled in online courses to expand the curriculum of their local school (33%), scheduling conflicts (16%), or to make up credits (15%). Students were also likely to enroll in online courses for reasons of enrichment or to expand their learning (28%)

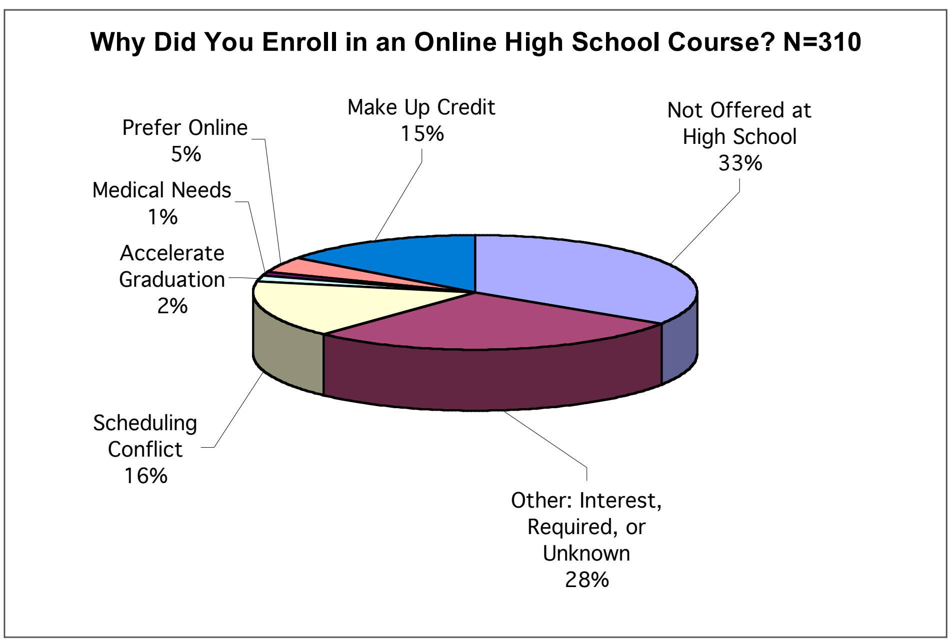

Figure 1: Reasons for Enrolling in Virtual High School Courses.

There were 20 positive statements about the quality or usability of some feature of the online course presented in the online evaluation form. Students were asked to react to the statements by rating each statement along a Likert scale as Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. For analysis purposes a value was assigned to each possible response along an ordinal scale from –2 to + 2 where Strongly Disagree was –2, –1 was Disagree, Neutral was 0, Agree was +1, and Strongly Agree was +2. Table 1 provides the mean student rating on this scale for the top 5 statements (Mean >.50) on the evaluation form by amount of student agreement with the statement.

Table 1: Mean Rankings of Evaluation Statements (N=290)*

RANK (high to low)	MEAN	STUDENT EVALUATION PROBE
1	.78	16. The instructor seemed to have a thorough knowledge of the subject.
2	.65	14. The instructor provided helpful feedback and assistance throughout the course.
3	.61	13. The instructor was sensitive to student difficulties with the course work.
3	.61	15. The instructor encouraged me to communicate with her throughout the course.
4	.59	9. The work and study requirements and grading system were made clear and were fair.

**Scale: -2=Strongly Disagree, -1=Disagree, 0=Neutral, +1=Agree, +2=Strongly Agree*

The student responses for each of the 20 items were summed to create a total scale score indicating overall student satisfaction with the online course. The mean for the total scale was 7.99. A stepwise regression model was formulated to determine those statements that best predicted the overall student satisfaction with the online course. Four factors predicted over 90% of the variance in student responses on the scale (see Table 2).

Table 2: Best Predictors of Overall Student Satisfaction with an Online Course (N=290)*

PREDICTOR	R	R Square	R Square Change
20. I would recommend this course to others.	.841	.707	.706
14. The instructor provided helpful feedback and assistance throughout the course.	.918	.842	.841
10. Course assignments were challenging, worthwhile, and helped me learn about the subject.	.942	.888	.887
4. I was satisfied with the amount of interaction I had with the Web course teacher.	.957	.915	.914

There were 47 student evaluation forms that included responses about student learning styles and/or preferences. Two questions about online and classroom learning preferences were presented with a checklist of possible responses. Students were requested to select 1, 2, or 3 ways that best helped them to learn in the regular school classroom and in an online course. Students could also enter other learning preferences if they did not find their selection on the list.

For learning in an online course, student evaluators most often selected the following learning preferences:

- When online learning activities are relevant to the real world. (20)
- When the online course presents important information using graphics, video, and audio. (19)
- When the online course allows me to practice using online forms, tools, and examples. (17)
- When I can have email discussions with the teacher. (13)

For learning in the regular school classroom, student evaluators most often selected the following learning preferences:

- When the teacher presents information I did not previously know. (19)

- When a classroom activity or problem is relevant to the real world. (18)
- When the teacher individually tutors me or works with me one-on-one. (18)
- When I work with other students in a small group or team. (14)

High School Student Achievement in K-12 Online Courses

Original data sources in the form of the student enrollment database and school transcripts were examined for this evaluation. Of the student enrollments examined for this study, 46.3% were female, 52.2% were male, and 1.5% were not disclosed. The distribution of enrollments by content area was as follows: science (20.6%), foreign languages-mostly Spanish (16.4%), mathematics (16.1%), social studies/social sciences (14.5%), language arts (13.2%), health (9.2%), skills development—for example, keyboarding (4.2%), business, (3.2%) art (1.3%) and technology (1.3%).

To examine the achievement of students in K-12 online courses, all students who completed an online course during the evaluation period were extracted from the enrollment database. The number of days to complete the course, the number of days in which a course was completed prior to maximum completion, and the mean and median days for completion and for course grades were computed for all course completers (see Tables 3 and 4). Completion rates by content provider and online course grades by subject for all completers are listed in Tables 5 and 6.

Table 3: Course Completion Rate in Days and Final Course Grade (6 month courses, N=530)

Time/Achievement Variable	*Minimum*	*Maximum*	*Mean*	*Median*
Days to complete	15	440	155.1	140.0
Days before maximum completion	0*	310	29.6	45.5
Grade in online course	23	100	85.3	88.0

**Some students went beyond the maximum completion date to complete the course.*

Table 4: Course Completion in Days and Final Course Grade (12 month courses, N=172)

Time/Achievement Variable	*Minimum*	*Maximum*	*Mean*	*Median*
Days to complete	27	466	162.9	140.0
Days before maximum completion	0*	338	192.3	225.0
Grade in online course	57	99	85.5	88.0

**Some students went beyond the maximum completion date to complete the course.*

Table 5: Completion Ratios by Course Provider (N=702)

	Enrollment		**Completions**		
Provider Name	**Frequency**	**Percent**	**Frequency**	**Percent**	**Completion Ratio**
Apex Learning	116	4.4	0	0	0%
Class.com	2260	86.9	658	93.7	29%
CyberSchool	75	2.9	3	.4	4%
eBush Learning	150	5.8	41	5.8	27%
Total	**2601**	**100.0**	**702**	**100.0**	**27%**

Table 6: Online Course Grades for All Course Completers

Subject/Category	*N*	*Grade Mean*	*Grade Std. Deviation*	*Scale Mean*	*Scale Std. Deviation*
Mathematics	91	82.76	11.99	2.80	1,22
Science/Health	285	84.25	10.92	3.00	1.94
Language Arts/Foreign Language	122	86.14	9.32	3.27	.79
Social Studies/Social Science	105	87.34	9.94	3.29	.94
Other	99	89.33	7.30	3.51	.71
All Subjects	702	85.56	10.40	3.14	.99

The correlation between student grades in the online courses and measures of achievement in school—Cumulative GPA and ACT Composite—were examined in this evaluation (see Tables 7 and 8). Because the sample size was relatively small (N=67), all cases in the sample were used for analysis and no tests of normality were conducted. To conduct this analysis, it was necessary to convert both course grades and transcript grades for each of the students in the sample to a similar scale. Assigning a letter grade (or transcript grade) to an online course numerical grade is the responsibility of the participating school district where the student resides. In most cases this analysis used the actual scale used by the district assigning the letter grade. When the actual grading scale was unknown for a student case, a scale used by most school districts in the sample was used to assign a letter grade: A=90-100, B=80-89, C=70-79, D=60-69, F=less than 60. Next, the course letter grades and transcript letter grades were assigned a numerical value using the scale: A=4, B=3, C=2, D=1, F=0. The Spearman rho was used to compute the correlation between the online course grade and other school measures of achievement because it is appropriate for data that do not satisfy the normality assumption. The Spearman rho yielded significant correlations ($p < .000$) between the online course grade and the cumulative GPA and ACT Composite score.

Table 7: Student Achievement from Student Transcripts and Online Course

Measures of Achievement	***N***	***Mean***	***Std. Deviation***
Online Course Grade	67	82.567	9.545
Cumulative GPA	67	3.301	.723
ACT Composite	39	23.770	3.700

Table 8: Correlation between Online Course Grade and School Measures of Achievement

School Measures of Achievement	***N***	***Sig. (2-tailed)***	***Correlation Coefficient***
Cumulative GPA	67	.000	.524
ACT Composite	39	.000	.548

DISCUSSION

Overall, online delivery of instruction fulfills a very real and practical need in the high school curriculum, especially for students in small or rural high schools. While some limitations on course offerings exist in all high schools, in those schools restricted by access to resources and/or expertise due to geography or socio-economic factors, curriculum-based, online courses for high school students may provide a realistic and affordable solution for these limitations in the curriculum of many secondary schools. Although students often reported that they enrolled in online courses due to scheduling issues—the course was not offered at their school, there was a scheduling conflict, or they were making up credit—students also were likely to enroll in online courses for reasons of enrichment or to expand their learning.

Having quantified and qualified many sources of data for this evaluation, it is now appropriate to ask: What did this evaluation reveal about this virtual high school's programs that we did not know before? The following findings are based on general interpretations of the data collection and analysis performed for this evaluation. These findings, hopefully, provide some insight into the design and delivery of online learning in a virtual high school environment:

- Online learning, even teacher-directed online learning, operates under the supposition that students are (or want to be) responsible for their own learning. High school students in general, however, are not equipped to be responsible for their own learning (and therefore may not want to be responsible). Possibly, this incapacity of high school students is the effect of many years of learning experiences in a public education system that tells students what, when, where, and how much (or how little) to learn.

- The primary problems and issues related to online learning are technical difficulties related to access or installation. Some technical problems may occur at the local level due to old hardware or slow Internet connections, while other technical problems may occur at the delivery level (e.g., students not understanding how to properly install or use course, course developers not implementing universal design principles into course content).
- A large number of students who enroll in online courses ultimately drop out. A number of reasonable explanations for drops exist that are not necessarily related to course quality, design, or delivery problems or issues. In many studies, attrition rates are cited as a major difficulty of online education (see Roblyer & Elbaum, 2000). It is important to recognize that because online courses are anytime/anywhere, that characteristic itself may give support to the likelihood of many drops. Therefore, the virtual high school should be equipped with a student feedback process for debriefing students who drop courses (as well as those who complete courses).
- One feature of online learning that proponents usually tout as its main strength is asynchronous communications. High school students, however, often perceived this feature as a disadvantage of online learning. High school students seemed to consider learning as consisting of a series of *teachable moments* that are created by something a teacher says or does in the classroom.
- Online delivery of instruction appeared to fulfill a real and practical need in the high school curriculum, especially for students in small or rural high schools. While some limitations on course offerings exist in all high schools, in those schools restricted by access to resources and/or expertise due to geography or socio-economic factors, curriculum-based, online courses for high school students may provide a realistic and affordable solution for these limitations in the curriculum of many secondary schools.
- Students enrolled in online courses for reasons of enrichment as much as matters of necessity. Although students usually enrolled in online courses to expand the high curriculum or to solve scheduling conflicts and make up credits, students often enrolled in online courses because they were interested in the subject and the courses were not offered at their school.
- Although students often admitted to procrastinating or being undisciplined in their approach to completing online learning activities, when students did complete a course, they generally completed it in a reasonable amount of time.
- Students had favorable attitudes about online teachers. Teachers played an important role in online instruction. The synchronous and asynchronous interventions they provided were an important component of online teaching and learning.
- Based on results from a small sample of students, it appeared that student achievement (grades) in online courses was at least equal to (and slightly) higher than student achievement in high school classrooms.
- Online courses have the potential for enriching the curriculum of a school and increasing the learning opportunities for students.
- Online courses provide a standards-based curriculum resource for home-schooled students.

Recommendations for Improvement and Future Research

The following recommendations for continuous improvement of the virtual high school are proffered, based on the findings of this evaluation. (Note: Many of the following recommendations have been instituted by the virtual high school since this evaluation study was completed.)

- Administer a diagnostic assessment to students enrolling in an online course to help predict their success in online courses and provide an online orientation to reinforce the results of the diagnostic assessment.
- Collect additional data on the reasons why students drop online courses by developing a system for conducting exit interviews or obtaining feedback from students who drop online courses.
- Focus more evaluation efforts and analytical methodologies on individual course design and course design by provider. A sample of high and low enrollment and completion courses should be selected for instructional analysis to identify features of course design that may promote or hinder online

learning. These analyses should facilitate comparisons between the design and implementation features of online courses and educational best practices for teaching and learning with technology as well as ensure that online courses incorporate principles of universal design for education.

- Place higher expectations for course completion on students by decreasing the amount of time a student has for completing a course. The features of online learning should be fully exploited to realize optimal efficiency in online course-taking and completion. Higher expectations on students may also serve to increase the discipline and responsibility of the individual student for learning in an online instructional environment.
- Increase the amount of synchronous and asynchronous communication between online instructors and students by increasing online "office hours" and imposing limits on course size per instructor. Students relate learning to the presence of a teacher and at times may not proceed with online learning activities until a teacher resolves the issue. Additionally, a process for logging and analyzing synchronous and asynchronous instructor/student interactions should be implemented.
- Decrease course size to permit teachers to provide more online time with each student.
- Implement agreements with participating high schools to provide student transcripts to use for comparisons between online course achievement and achievement in school. Participating schools should provide profiles of the grading scale and the units of credit required for high school graduation.
- Review the curriculum of courses from providers with low student completion rates. Minimum standards for student completion rates should be maintained for all course providers. Providers should be informed of student completion rate standards and when rates fall below the minimum, the provider curricula should be subject to review to determine the reason for low completion rates.

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AUTHENTIC ASSESSMENT OF TECHNOLOGICAL FLUENCY: THE COMPUTER ASSESSMENT AND TUTORIAL ONLINE

Steven C. Mills
The University of Kansas

ABSTRACT

Technological fluency is the combination of information skills, communication skills, and technology skills necessary to function in a technological environment. In partnership with Synergistics Systems, an educational software company, the College of Education at Pittsburg State (KS) University and researchers from the University of Kansas designed, field tested, and published a commercial online performance assessment tool for diagnosing technological fluency. The purpose of this paper is to discuss the development of this online assessment system and to examine results of its administration to teachers across multiple educational contexts.

INTRODUCTION

Integrating technology into the curriculum of the classroom is becoming an inseparable part of good teaching. Current research on learning suggests that the real power of technology in the classroom is embedded in its potential to facilitate basic changes in the way teaching and learning occurs in the classroom. Powerful technologies are sometimes used in limited ways that result in sustaining rather than transforming educational practice (Cuban, 2001) because there is not a universally-accepted understanding for integrating technology in the classroom.

While interest in using technology for educational activities has increased significantly among educators, the educational practices of teachers are not always concomitant with the active, student-centered learning environments that are so effectively facilitated through information technologies. Using technology as a tool for teaching and learning in the classroom often requires teachers to modify their actual classroom practices.

In a report for the Milken Family Foundation, Kathleen Fulton (1997) described "technological fluency" as the combination of information skills, communication skills, and technology skills necessary to function in a technological environment. According to Fulton, technological fluency is based on the ability to find information from a variety of sources and disciplines, to make judgments about the value, reliability, and validity of information, and to create and disseminate information using technology-mediated communication formats. For students to become technologically fluent, the teachers who teach them must be technologically fluent. Technologically fluent teachers are characterized by modeling technology use in the classroom, by applying technology skills across the curriculum, and by applying technology skills to problem-solving and decision-making in authentic learning environments. In the classroom, technological fluency is the difference between learning *about* technology and learning *with* technology.

In partnership with Synergistics Systems, an educational software company, the College of Education at Pittsburg (KS) State University and researchers from the University of Kansas designed and implemented a model to promote the development of technological fluency in

teachers using a performance-based approach for validation of technology skills. Instead of requiring the completion of a sequence of courses or training activities, this model was designed to require university faculty, cooperating teachers, and, ultimately, student teachers to demonstrate their proficiency in technology use and integration through performance assessment using a "just-in-time" approach to professional development. This online assessment tool used simulated learning experiences to allow teachers to demonstrate technology skills and fluency.

A MODEL FOR TECHNOLOGICAL FLUENCY

Standards reflect shared values by identifying and describing those things that are important for a teacher or student to know and do. The technology standards established in this model were synthesized from local and state technology standards for students and teachers and relied upon the International Society for Technology in Education National Technology Education Standards for Students and Teachers. These standards were then organized into stages or *phases* to reflect a developmental process from novice technology operators to advanced technology facilitators to expert technology integrators. These phases of technological fluency were assumed to reasonably reflect the reality of technological fluency and were used to assess the relative level of technological fluency of college faculty, cooperating teachers, and student teachers.

An educational model, the *Technological Fluency Configuration Matrix* (*TFCM*), was formulated for this assessment based on a consensus-building process that followed a procedure developed by Heck, Steigelbauer, Hall, and Loucks. (1981) and used previously by the author (Mills, 2001-2002; Mills & Ragan, 2000; Mills & Tincher, 2003). An expert panel comprised of the teacher education faculty, pre-service teachers, and a corporate partner representative, was charged with establishing the criteria for the technological fluency model. The expert panel conducted an exhaustive review and evaluation of national and institutional technology standards over several months and established a model of technology standards and indicators, the *TFCM*, that provided the conceptual framework for the online assessment tool.

The *TFCM* was based on the premise that teachers experience stages of development to become expert technology integrators. Therefore, we organized these standards into *phases* to reflect a developmental approach from novice technology operators who use technology as a tool for professional productivity to technology facilitators who use technology as a tool for the delivery of instruction to expert technology integrators who are augmenting student learning with technology.

The expert panel reached consensus on 16 technology integration standards for the model (see Table 1). Each successive phase of the *TFCM* was intended to identify a set of instructional strategies that exemplified a more appropriate use of technology for facilitating or enhancing student learning in the classroom along a continuum from technology as a tool for professional productivity (Phase 1) to technology as a tool for the delivery of instruction (Phase 2) and ultimately to the establishment of learning environments where student learning is augmented by technology (Phase 3). The *TFCM* was used as the conceptual framework for the online assessment tool.

Table 1. Stages of Technological Fluency

PHASE I – TECHNOLOGY APPLICATIONS AND OPERATIONS
1. Operate common technology devices including computer keyboard, mouse, monitor, printer, video camera, digital camera, VCR, scanner, or projection device
2. Perform basic file management tasks using a local computer drive or drive on a computer network
3. Apply trouble-shooting strategies for solving routine hardware and software problems that occur in the classroom
4. Use software productivity tools to prepare publications, analyze and interpret data, perform classroom management tasks, report results to students, parents, or other audiences, and/or produce other creative works
5. Use technology to communicate and collaborate with peers, parents, and the larger community through email, Internet, and discussion groups to nurture student learning
6. Use technology to locate, and collect educational research/best practices information from a variety of sources such as library databases
PHASE II – TECHNOLOGY FACILITATION AND MANAGEMENT
7. Practice and model responsible use of technology systems, information, and software
8. Facilitate equitable access to technology resources for all students
9. Manage student-learning activities in a technology-enhanced learning environment
10. Select information and educational resources, hardware requirements, and software features to support curriculum needs and standards
11. Demonstrate strategies to assess the validity and reliability of data gathered with technology
PHASE III – TECHNOLOGY INTEGRATION IN TEACHING AND LEARNING
12. Employ technology in classroom learning activities in which students use technology resources to solve authentic problems in various content areas
13. Employ technology to address the diverse learning needs of students
14. Apply multiple methods of evaluation and assessment to determine learners' use of technology for learning, communication, problem-solving, and productivity
15. Engage learners in the development of electronic portfolios that document their technology-based educational experiences
16. Use technology resources and productivity tools to collect, analyze, interpret, and communicate learner performance data and other information to improve instructional planning, management, and implementation of instructional/ learning strategies

To create a model that could be used for performance assessment of technology skills, the model was organized into a two-dimensional matrix with each technology standard representing a component along one dimension of the matrix and variations (indicators) for each standard as the other dimension of the matrix. These variations or indicators consisted of discrete categorizations of technology integration that represented or defined specific classroom practices supporting teaching and learning.

The variations for each component were organized along a continuum from unacceptable use to ideal use. For example, in determining variations for the component, *Use software productivity tools to prepare publications, analyze and interpret data, perform classroom management tasks, report results to students, parents, or other audiences, and/or produce other creative works*, creating a simple document using word processing was construed to be Minimal use while creating a *PowerPoint* project was construed to be Ideal use. The component variations were refined by the expert panel to reflect actual practices of teachers integrating technology in classrooms. The component variations were organized into a matrix comprised of four variations for each of the 16 standards with each successive variation indicating a level of use representing a closer approximation of ideal use and/or technological fluency.

THE COMPUTER ASSESSMENT AND TUTORIAL ONLINE ASSESSMENT

Using the *TFCM* model as a foundation, Synergistics Systems developed the *Computer Assessment and Tutorial-Phase 1 (CAT1)*, which transformed Phase 1 of the model into a commercial online product (see Table 2). Each of the four indicators for each of the six technology standards in Phase 1 became 24 performance measures for the *CAT1*. A computer simulation for each of the 24 performances measures was developed to provide authentic representations of the various computer desktops seen by the computer user.

Table 2. Standards and Indicators for Phase 1, Technological Fluency Configuration Matrix

Phase I – Technology Applications and Operations				
Technology Standard (Technology Integration Classroom Practice)	**Technology Indicator (An Example of the Practice Would Be):**			
	1 MINIMAL USE	2 MODERATE USE	3 ADVANCED USE	4 IDEAL USE
1. Operate common technology devices including computer keyboard, mouse, monitor, printer, video camera, digital camera, VCR, scanner, or projection device	Use mouse and/or keyboard function keys to select a screen icon	Configure printer settings	Configure a computer's monitor for projection	Scan an image with a scanner and transfer to an electronic file
2. Perform basic file management tasks using a local computer drive or drive on a computer network	Search for a file on a local hard drive by name, type, or date	Create a folder on the hard drive and copy a file to that folder	Create an icon or shortcut on the desktop and use it to open an application	Zip and unzip a file
3. Apply trouble-shooting strategies for solving routine hardware and software problems that occur in the classroom	Properly shut down and restart computer when computer hangs or locks up	Check RAM usage and hard drive space	a) Run a utility to determine if a disk is repairable	Download and install a program from the Internet or a local drive
4. Use software productivity tools to prepare publications, analyze and interpret data, perform classroom management tasks, report results to students, parents, or other audiences, and/or produce other creative works	Create a word processing document and format for printing	Prepare a word processing document that includes a spreadsheet	Prepare a form letter and merge it with a mailing list file	Prepare a PowerPoint project
5. Use technology to communicate and collaborate with peers, parents, and the larger community through email, Internet, and discussion groups to nurture student learning	Send an email message to an existing name in the address book	Add a name and address to an email address book	Set e-mail program to apply a signature to email messages	Prepare a distribution list and send an email message to every contact on the list
6. Use technology to locate, and collect educational research/best practices information from a variety of sources such as library databases	Browse the Internet to locate useful information using specific URLs	Perform a search using an Internet search engine	Subscribe to and read electronic newsletters or journals related to an area of education	Perform a search of an academic database

Additionally, an instructional component was developed for the *CAT1* to provide support for each of the 24 performance measures. Because the allocation of appropriate amounts of time are important to technology professional development, instructional units were "anchored" to each of the 24 performance measures to enable a "just-in-time" learning approach. This "just-in-time" approach allowed the program to address the multiple learning needs of the users. Those who needed help in particular areas could request help from the system while others could progress through the assessment unassisted.

The *CAT1* went through several iterations in development. An alpha version was administered to approximately 100 marginally to highly technological fluent participants with members of the panel as observers. Observers noted the performances of highly technologically fluent participants' performances to determine if there were specific performance measures that they were unable to complete properly. Modifications were made to the performance measures as needed to better reflect actual teacher practices using technology.

A beta version of the *CAT1* was administered to 197 university faculty members, in-service teachers, and pre-service teachers. These administrations were unassisted and unobserved. Again, modifications were made to performance measures and their instructions based on post-administration interviews and the final version of the *CAT1* version was published. The data reported in this paper are based on administrations of the final version of the *CAT1* to teachers.

The *CAT1* Program Menu is divided into selection boxes for each of the six standards areas. Each selection box contains statements of the standard and the four performance measures for that standard (an example of Standard 4 is presented in Figure 1). To the right of each performance measure statement, the user's completion status in relation to that performance

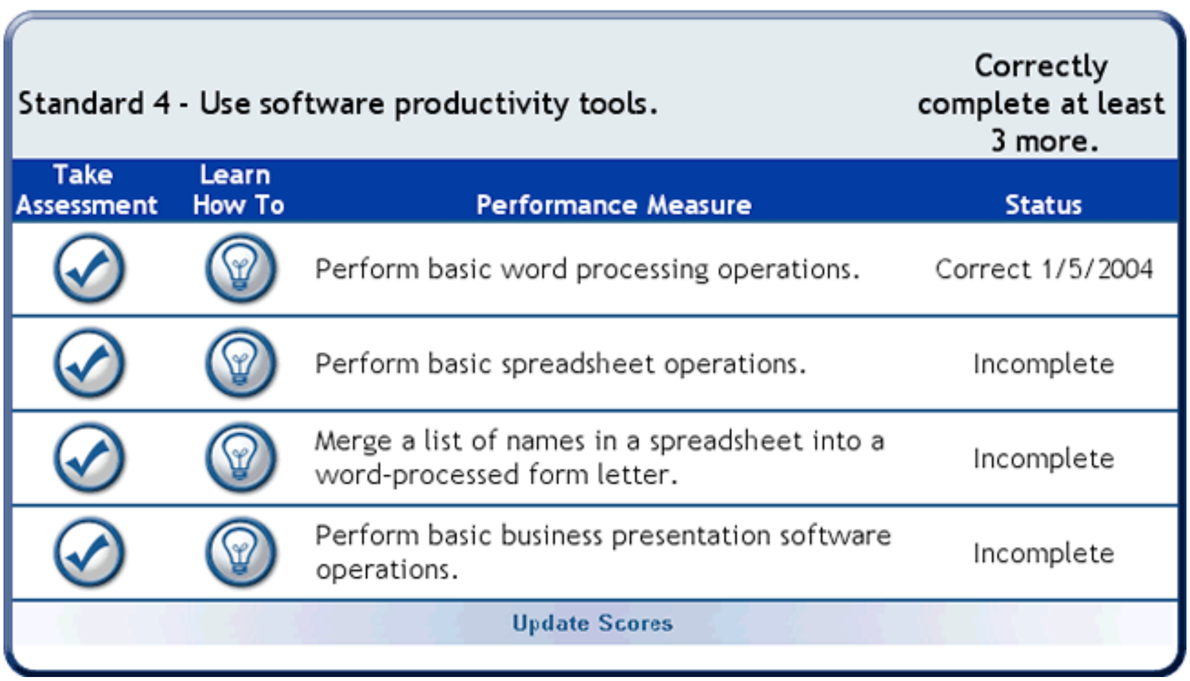

Figure 1. Standard 4 Selection Box

measure is displayed. To the left of each of the performance measure statements are clickable buttons shown as a check mark in a circle and a lightbulb in a circle. Clicking the check mark button allows users to take the assessment for that performance measure (see Figure 2) and clicking the lightbulb presents users with a set of instructional activities for that performance measure (see Figure 3). The program is conceptualized so that if users know how to perform that task described by the performance measure, they can immediately take the assessment, but if they think they do not know how to perform the task, they can receive an online instructional intervention.

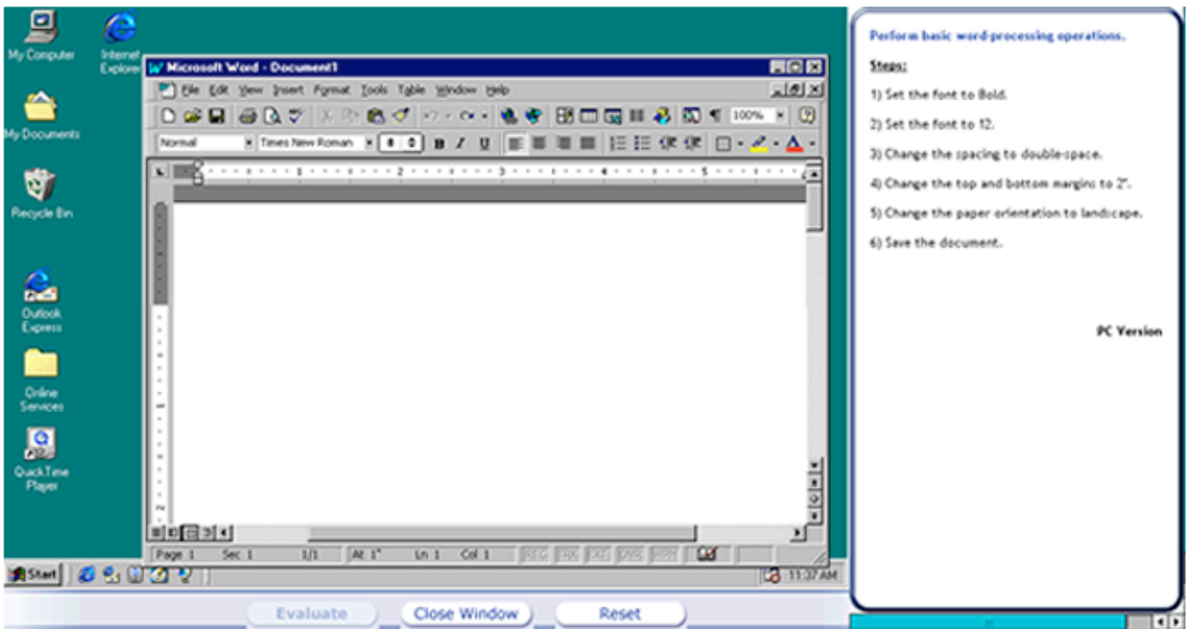

Figure 2. Take Assessment window for first performance measure of Standard 4.

When users select the Take Assessment (check mark) button for a performance measure, a simulated desktop is loaded into in the upper-left section of the browser window and a set of directions for demonstrating performance are listed down the right side of the browser window. (An example of the first performance measure Standard 4 is presented in Figure 2.) The task to perform is stated in blue at the top of the directions followed by the steps for demonstrating competency for that performance measure. After all the steps for the task are performed, the user selects the Evaluate button. The user may also click Reset or Close Window to begin the assessment anew without scoring the current work on the performance measure. If the steps have been completed correctly, a message is displayed indicating work is correct. If the user does not complete the steps correctly, a message is displayed indicating the work is incorrect and why it is incorrect. The user can select Help and will be linked to the appropriate instructional activities for the performance measure (an example of the instructional interventions associated with the performance measures for Standard 4 is presented in Figure 3).

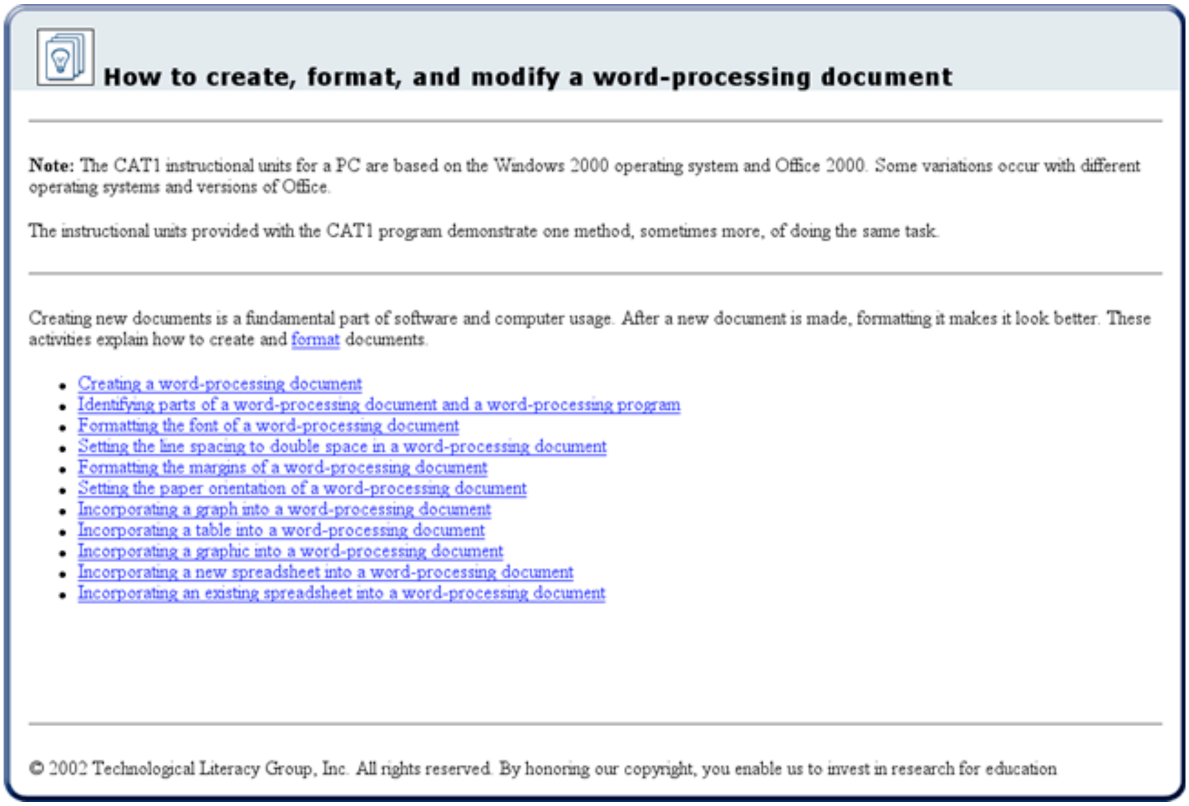

Figure 3. Online instructional interventions available for Standard 4.

When users make two attempts at a particular performance measure and are unable to complete it successfully either time, they are restricted from attempting that performance measure for a period of one week by the program. Because users are only permitted three attempts on each performance measure, this "lock out" period is intended to enable users to seek interventions for successfully completing the performance measure using the online instructional materials, a knowledgeable colleague or mentor, or to access other instructional materials.

EVALUATION OF THE COMPUTER ASSESSMENT AND TUTORIAL

The results of the *CAT1* administration were examined for a sample of 374 teachers from multiple educational contexts including a rural high school in northern California, an urban high school in the South, and a rural New England school district. The study sample also included career and technical teachers from several southeastern states, administrators and teachers in a suburban technical school district in the Northeast, and middle and high school teachers from across the United States attending a professional development workshop (see Table 3). The unit of measure for the data analysis was the number of attempts by participants to accomplish the performance for each of the 24 technological fluency indicators.

The majority of cases, often a large majority, successfully completed each indicator on the first attempt. Overall, 80% of teachers were successful on the first attempt and 96% of teachers were successful after three attempts. The teachers in the sample frequently used the

online instructional interventions. Overall, 32% of teachers used interventions at least once in three attempts.

There were only three indicators in this sample with a failure rate of 10% or more. These indicators were 2.2—Create a folder on the hard drive and copy a file to that folder (10%); 2.4—Zip and unzip a file (13%); and 4.2—Prepare a word processing document that includes a spreadsheet (16%).

Table 3. Attempts by Teachers on the *CAT1* (N=374)

Ind.	N Attempts	PASSED								USED INTERVENTION							
		1st Attempt		2nd Attempt		3rd Attempt		Fail/ Incomp.		1st Attempt		2nd Attempt		3rd Attempt		Fail/ Incomp.	
		Gain #	Gain %	Gain #	Gain %	Gain #	Gain %	#	%	Gain #	Gain %	Gain #	Gain %	Gain #	Gain %	#	%
1.1	374	362	97%	12	100%	0	100%	0	0%	107	29%	3	29%	0	29%	0	0%
1.2	365	303	83%	52	97%	5	99%	5	1%	69	19%	35	28%	3	29%	3	1%
1.3	362	348	96%	8	98%	1	99%	5	1%	82	23%	5	24%	1	24%	4	1%
1.4	349	200	57%	104	87%	19	93%	26	7%	68	19%	63	38%	14	42%	17	5%
2.1	349	308	88%	28	96%	6	98%	7	2%	93	27%	17	32%	6	33%	2	1%
2.2	328	207	63%	63	82%	25	90%	33	10%	56	17%	32	27%	21	33%	21	6%
2.3	327	255	78%	42	91%	12	94%	18	6%	92	28%	19	34%	9	37%	7	2%
2.4	274	140	51%	77	79%	22	87%	35	13%	70	26%	56	46%	21	54%	22	8%
3.1	294	290	99%	2	99%	0	99%	2	1%	83	28%	2	29%	0	29%	1	0%
3.2	293	267	91%	20	98%	3	99%	3	1%	70	24%	7	26%	2	27%	1	0%
3.3	278	179	64%	55	84%	23	92%	21	8%	55	20%	24	28%	18	35%	8	3%
3.4	251	224	89%	19	97%	3	98%	5	2%	81	32%	14	38%	1	38%	1	0%
4.1	278	226	81%	39	95%	3	96%	10	4%	53	19%	15	24%	2	25%	4	1%
4.2	240	145	60%	45	79%	11	84%	39	16%	62	26%	26	37%	7	40%	24	10%
4.3	214	199	93%	6	96%	1	96%	8	4%	80	37%	6	40%	1	41%	3	1%
4.4	213	157	74%	32	89%	8	92%	16	8%	46	22%	14	28%	4	30%	10	5%
5.1	226	201	89%	19	97%	1	98%	5	2%	36	16%	12	21%	1	22%	1	0%
5.2	221	126	57%	69	88%	17	96%	9	4%	23	10%	21	20%	7	23%	2	1%
5.3	206	115	56%	67	88%	17	97%	7	3%	61	30%	36	47%	15	54%	3	1%
5.4	198	177	89%	14	96%	4	98%	3	2%	73	37%	10	42%	4	44%	2	1%
6.1	207	202	98%	3	99%	0	99%	2	1%	52	25%	2	26%	0	26%	1	0%
6.2	214	170	79%	29	93%	6	96%	9	4%	31	14%	18	23%	5	25%	4	2%
6.3	205	192	94%	12	100%	0	100%	1	0%	38	19%	4	20%	0	20%	1	0%
6.4	206	192	93%	9	98%	1	98%	4	2%	35	17%	2	18%	1	18%	1	0%
Total	6472	5185	80%	826	93%	188	96%	273	4%	1516	23%	443	30%	143	32%	143	2%

Gain % is cumulative across attempts. Passed values are inclusive of Intervention values.

CONCLUSIONS

The just-in-time approach of the *CAT1* allows individuals who are unsuccessful on a performance measure to be led to an embedded instructional unit containing a number of performance-related activities. Individuals can use these embedded instructional interventions (or

instructional interventions external to the system) to review or learn the procedures needed for successfully completing the performance measure. Additionally, if individuals realize that they are not capable of successfully completing a performance measure, they can go immediately to the embedded instructional interventions to learn the procedures for successfully completing the performance measure prior to attempting the performance.

The data from the evaluation confirm the effectiveness of this just-in-time approach to assessing technological fluency in teachers across educational contexts. Overall cumulative gain was 96% on the 24 performance measures after three attempts. Cumulative gain was 95% or more on 18 of the 24 performance measures after three attempts and 90% or more on 22 of the 24 performance measures after three attempts. These results indicate that individuals who were unsuccessful on the first attempt at a performance measure were helped by *CAT1* instructional interventions embedded in the system or by related instructional activities external to the *CAT1* (although instructional interventions could be accessed prior to the first attempt as well).

Extension of the *CAT1*

The *CAT1* is intended to be a model for the *CAT2* and *CAT3*.The overall instrument is currently being extended and expanded to include Phases 2 (technology management) and 3 (technology integration). The management system of the *CAT1* will support implementation of the subsequent phases, but human evaluators will be required to administer Phases 2 and 3 performance assessments.

In Phases 2 and 3 of the *CAT*, participants will develop portfolios as directed by the online program, submit the portfolios for review, and receive feedback from a qualified human evaluator as to the level of fluency the participant has demonstrated. While each participant has the freedom to choose the context and content of his/her portfolio, the portfolio guidelines ensure that the skill indicators related to specific standards are captured within the portfolio. Submission of the portfolio, review, and feedback are transacted through an online interface. The data management system of the *CAT1* allows the monitoring and tracking of participants through the phases of technological fluency.

DISCUSSION

Through the establishment of a well-defined set of pedagogical standards and indicators, higher levels of technological fluency in classrooms can be identified and achieved. Consequently, when teachers know how to use and then actually use all the tools at their disposal, the potential for student learning is increased. The model for technological fluency described in this paper represents a flexible and adaptable model that reflects a subset of widely-used technology standards. This subset is only one sample of all the possible technology standards and indicators that may exist or be constructed. The *CAT1* and the associated technological fluency model was used by teachers from several educational contexts and the examination of the results of these multiple administrations contributes to its validity and reliability in diagnosing technological fluency among college faculty, career teachers, and student teachers.

To prepare technology-proficient teachers for the information age, teacher preparation programs must first provide faculty with the technology skills and equipment to effectively model the use of technology. Because teachers may tend to teach the same way they were taught

in school (and college), it is necessary to change the educational experience of teacher education students. For university faculty to teach with technology, however, they must have a teaching environment that is rich in technology resources and supports to help them implement technology into their own courses and curricula. Thus, in addition to a supporting infrastructure, ongoing professional development is a critical component for any technology integration initiative.

The digital divide is a still factor among students in many teacher preparation programs, which means that many teacher candidates entering a program did not have access to computers and the Internet at home or school as secondary students. Thus, students continue to enter teacher preparation programs with a wide range of technology skills. This variation in technology proficiency among teacher candidates and even in expectations of them in relation to technological fluency continues to be an issue that is difficult to address in teacher education courses. The *CAT1* is designed to diagnose these variations in technology skills among teacher candidates and allow teacher candidates to seek out instructional interventions specific to their individual learning needs.

The information gathered through the use of the *CAT1* and its successors can provide a way for teacher preparation programs and school districts to determine the content of future instructional and professional development activities. Additionally, knowledge of the technological fluency of educators can inform other decision-making related to the preparation and professional development of teachers for the information age.

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DISTANCE & ONLINE EDUCATION FOR TEACHERS OF GIFTED STUDENTS

Theresa Monaco, Ph.D
University of Houston
College of Education
Center for Gifted Education

How can teachers learn about gifted education and identified gifted students and at the same time acquire credentials? The purpose of this presentation is to describe the content and processes offered teachers to earn teaching endorsement in gifted education and/degrees through interactive television, cable television or taped purchased classes. The content objectives of the classes are the same as face-to face classes. The content delivery allows fifteen-minute lecture-time in every hour and the rest of the time is devoted to seeing/discussing insert tapes of effective teaching, leaders in the field present current practices and discussion of related research.

Since distance from any university campus involves commuting, dealing with traffic, and parking problems, teachers of gifted students want convenience added to their schedule. They want information and competence to teach gifted students made available through the most time/convenient effective methods.

In this fast paced, time sensitive era, teachers of teachers uphold the content standards of face-to face-classes and at the same time are sensitive to distance delivery methods. The quality of content delivery from single classes to complete degrees, formerly only available in the traditional face-to face university class, is now available to teachers through the technology of distance education.

Many times they are willing to bear the cost of taking classes by “tape purchase”, cable television or the internet to off-set commuting inconvenience. Now, we are at a point in time of change where teacher learning curve is commensurate with the amount of time and energy, teachers have to embrace the newer technological advancements. As teachers become more knowledgeable and comfortable with the use of computer technology, videotape purchase or cable television may well take its place in history in favor of computer/internet literacy as the most time/cost/efficient method of earning credentials and degrees.

Today, as teachers learn by varied class activities through face-to-face or taped classes, they see models of exemplary practices in other classrooms. Teachers see and can set the comfort zone in their classrooms to allow students to acquire information and demonstrate competence. The visual, auditory and haptic methods of curriculum delivery are modeled by the teacher of teachers.
This modeling paves the way for teachers to demonstrate competence in their classrooms.

The Distance & Online Education Teachers of Gifted Students Learn by:

Reading = text options; Internet search through Education Research Information Center (ERIC); and other databases.

Hearing = No more than fifteen minutes per hour
(Leaders/administrators in the field of gifted describe how they teach identified gifted students in their school district.... with five to ten minute video-clips of schools ...with classroom/participant discussion)

Seeing = Ten minute tapes of exemplary teaching practices in classrooms for gifted students ...with classroom/participant discussion.

Writing = Weekly Analysis of the text, tape and additional internet/library readings

Doing = Developing a product related to the course that demonstrates competence.
(A persuasive presentation to the school board on the need for a gifted program or a differentiated curriculum for a group of identified gifted students that demonstrate the ability to interrelate three curriculum subjects).

Prior to the advent of flexible classroom arrangements, many teachers focused primarily on the lecture teaching method of student learning. Some teachers still use this method today. If gifted students are not successful in the lecture method, it does not mean that they are not exhibiting "giftedness".

Teachers and researchers points out that given any group of students, the majority of students are not auditory learners and those that are tend to forget what they learn during summer vacations. The rate of forgetting is related to factors associated with the acquisition and frequency of usage of learned material.

Arranging activities that teach concepts according to the students learning styles, offsets proactive inhibition and retroactive inhibition which has a singular and interaction effect on learning new concepts and effects previously learned concepts. The format of this presentation will model how teachers learn using visual, auditory and haptic activities through distance education interactive television to earn credentials.

Virtual Higher Education in Venezuela: Reality and Perspectives

Anymir Orellana, MSc.
orellana@nsu.nova.edu
Nova Southeastern University

Abstract

This paper is documentary and descriptive. It is based on previous research related to Venezuelan virtual higher education promoted by the *Instituto Internacional para la Educación Superior en América Latina y el Caribe* (International Institute for Higher Education in Latin America and the Caribbean IESALC). This paper's purpose is to examine the current trends of virtual higher education in Venezuela, and the efforts that are being made by Venezuelan higher education institutions.

Introduction

Venezuela is a medium-sized country strategically located in the north of South America, with an extension of 916,445 Km^2, and an estimated population of 25.1 millions by the year 2002 (IESALC, n.d.). One of the country's largest wealth lies within its human resources. More than 33% of the population is between 5 and 19 years old (IESALC), approximately 6% of the population holds a higher education degree (Morles, Medina & Neptali, 2003), and currently there are approximately 924,000 enrolled students in higher education, out of which 870,000 are in undergraduate level (Morles et al.).

Despite its natural and human wealth, the country presents social inequities. Clearly, education is one of the means through which these social differences would eventually disappear. Nonetheless, the demand for participation into higher education has always been greater than the available spaces, and it is known that the students from lower-income classes have a lower probability of admission (Morles et al., 2003).

In order to better meet social demands, most higher education institutions have acknowledged the need to incorporate new teaching paradigms based on communication and information technologies. In 1980 the State developed the Academic Network of Research Centers and National Universities (*Red Académica de Centros de Investigación y Universidades Nacionales* REACCIUN) that has made possible the creation of several specialized sub-networks for the academic and scientific collaboration among researchers and higher education institutions (Morles et al., 2003). In addition to the use of technologies in the classroom by most higher education institutions, around 38% of the universities are currently developing virtual higher education programs (Curci La Rocca, 2003).

In this paper, the term virtual higher education is used as defined by the IESALC (Curci la Rocca, 2003, p. 63): Distance education offered by higher education institutions using information and communication technologies. Following is an overview of the Venezuelan higher education system, and of the virtual higher education programs in Venezuela.

Venezuelan Higher Education System

It is widely accepted in Venezuela that education is a means, an instrument, as opposed to an end. Education is an eminent service that requires an authentic and ample scope, both socially and geographically. The importance of education is established in the second article of the recent Venezuelan National Constitution, in effect since 1999, which states that education and work are the fundamental processes to reach the main goals of society and of the State (Morles et al.,2003, p. 14). In addition, in articles 102 and 103 of the Constitution, education is declared as a human right and a social obligation to which all citizens should have equal access in quality, opportunity and gratuity in all its levels from preschool to higher education, excluding graduate studies.

Basically, the Venezuelan higher education system is complex, characterized by (Morles et al., 2003): (a) a lack of national regulations; and (b) the existence of multiple heterogeneous and disarticulated institutions with diverse goals, of varied quality, that are practically ungovernable (Castellano cited in Morles et al.). Regardless of regulations, institutions attempt to reach the goals of higher education as established in the Venezuelan Organic Law of Education, in effect since 1980. These goals are to deliver specialist professionals; to promote continuous professional improvement, promote research, arts and other creative manifestations of the human being, as well as to raise the cultural level of Venezuelans, in the benefit of society (Morles et al., p. 16).

Recent efforts have been made in Venezuela to give higher education the attention it deserves. In 2002 the *Ministerio de Educación Superior* (Ministry of Higher Education MES) was created as the entity that would rector, coordinate, and supervise the higher education national system. The Ministry is currently working in the creation of law to regulate the national higher education system (Morles et al., 2003). The Minister of Higher Education is the lead authority of the *Consejo Nacional de Universidades* (National Council of Universities CNU). The CNU is the entity that coordinates all private and official Venezuelan universities.

According to Morles et al.(2003), the Venezuelan Organic Law of Education is vague and complex regarding the classification of higher education institutions. However, the *Oficina de Planificación del Sector Universitario* (University-Sector Planning Office OPSU, cited in Morles et al.) classifies the higher education institutions into two main categories: (a) universities, which can be autonomous, national experimental, and private; and (b) university institutes and colleges, which are specialized in one or few knowledge areas, and can be polytechnic institutes, pedagogic institutes, university institutes of technology, university colleges, ecclesiastic institutes, military university institutes, and research institutes. According to its origin, institutions can be official (i.e. public) or private. Table 1 shows the distribution of higher education institutions by category.

Table 1
Distribution of Venezuelan Higher Education Institutions by Category

Type of Institution	Official	Private
Autonomous Universities	8	
Experimental Universities	13	
Private Universities		21
Other (non-universities)	43	61

Distance Education in Venezuelan Universities

Traditional distance education has existed for more than a hundred years (Keegan, 1996). However, the interest in this modality has grown in recent years due to the advances in information and communication technologies, such as Internet and the World Wide Web. According to Simonson, Smaldino, Albright and Zvacek (2003) the term distance education has recently been redefined as "institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors" (p.7).

Latin America and the Caribbean have not escaped to the impact of technology and globalization in higher education, or to the current trends in distance education. In the follow-up of the 1998 World Conference on Higher Education, The United Nations Educational Scientific and Cultural Organization (UNESCO, 2003) confirmed the impact that technology has had in higher education worldwide, and how information and communication technologies has represented a unique chance for developing countries. New technologies are considered instruments to reach access equity to higher education and to higher social relevance through its anywhere-anytime presence (Silvio, 2000, p. 186). In this sense, the IESALC was created by UNESCO in 1997 and has given technical, organizational, and financial support to the development of higher education virtual programs in Latin America and the Caribbean (Silvio).

The IESALC started a project in 2002 in order to explore the past, present, and future of distance higher education based on information and communication technologies in America and the Caribbean. The project consisted of national and regional studies in more than 30 countries. Regarding Venezuela, following is a synthesis of the research by Curci La Rocca (2003), from *Universidad Metropolitana*, who conducted a descriptive field study promoted by the IESALC that involved 42 Venezuelan universities registered under the MES.

Curci La Rocca (2003) used the following terms in her study.

1. Higher education: Undergraduate, graduate, and graduate continuous education courses and degrees offered in Venezuelan higher education institutes.
2. Virtual higher education: Distance education offered by higher education institutions using information and communication technologies.
3. New information and communication technologies: Technologies for communication through the computer based on the Internet, videoconferences, audio conferences, and satellite transmission.

4. Virtual academic program: Undergraduate, specialization, master, and doctorate programs, as well as continuous education courses based on information and communication technologies.

Evolution of Virtual Academic Programs

All of the Venezuelan higher education institutions that are currently developing virtual education programs are universities. Out of the 42 universities, 15 have current projects, 11 of them have a future project, and 16 of them have neither. Out of the 15 universities with current virtual academic programs, 8 of them are official. The study showed that in 1997 two private universities (i.e. Universidad Yacambú and Universidad Nueva Esparta) were pioneers in the insertion of virtual programs, experiences, or academic activities in Venezuela. The rest have incorporated progressively up until 2003.

Most universities inserted information and communication technologies through several stages. The most common stages mentioned by the universities were in this order: (a) awareness to change; (b) awareness to the use of the tools; (c) training; (d) content design and production; (e) course offering; (f) interest of pertinent authorities; and (g) formal implementation of the virtual teaching project. All universities started the virtual programs by deciding the type of technological infrastructure that would be used. The author concluded that in most of the universities the development of distance education programs was made in a bottom-up fashion, from the faculty toward the administration.

Media and Technological Platform

The courses in the academic virtual programs are completely developed by the university's faculty. Generally, the virtual programs are the same as the traditional education version, but adapted to the virtual modality with the same requirements, career plan, and faculty. For course management, 73% of the universities uses some technological platform, either commercial (i.e. WebCT, LearningSpace, Blackboard, Java Learning Environment, Intralearn, and Classroom Online), or developed by the institution itself.

As for delivery media, the results showed that all universities use email for synchronous communications, and most of them used one-to one chat for synchronous mode. The use of audio and video conferences is very low, perhaps due to the high cost of transmission in Venezuela. Also, Curci La Rocca (2003) noted that the use of virtual communities is very low and their creation is just starting. Table 2 shows the use of media in Venezuelan universities' virtual academic programs, according to the results reported by Curci La Rocca.

Table 2
Use of Media in Virtual Academic Programs of Venezuelan Universities

Use of media	Percentage of universities
Email communication	100%
Online courses	89%
Discussion forums	84%
Web pages as part of the course	79%
Discussion lists for collaborative work	79%
Student registration and administration online	74%
One-to-one chat communication	74%
Virtual classrooms	67%
One-to-many chat communication	63%
Virtual library	47%
Videoconference for instruction	26%
Audio conference for instruction	21%
Virtual communities	11%

Issues in the Development of Virtual Higher education in Venezuela

Curci La Rocca (2003) identified in her study some economical, political and human issues that need to be addressed in the development of virtual higher education in Venezuela. Following is a summary of the main issues.

1. The costs associated with the technological infrastructure are relatively high. In general, there is little accessibility to information and communication technologies in the university communities. The access rates of the national technological infrastructures are very high, depriving the middle and low social economical classes to take advantage of the virtual education. The Comisión Nacional de Telecomunicaciones (Venezuelan National Commission of Telecommunication-CONATEL, n.d.) estimated that by the year 2003 there were around 1.5 million Internet users in Venezuela, which roughly represents over 6% of the country's population.

2. There is no national law that regulates the virtual programs. Policies for virtual higher education have not been inserted into the current Organic Law of Education to guide the national educational system, or in the current Law of Universities to regulate these institutions.

3. Most of the faculty seems to be reluctant to change and the use of technology in the instruction. There still exists some doubt regarding the effectiveness and quality of virtual programs. However, there exits an important group of professors in each university motivated and willing to make the changes. Additionally, some universities do not remunerate or recognize the effort made by the faculty in the development of virtual courses.

4.

Summary

Distance higher education based on information and communication technologies (i.e. virtual higher education) represents an opportunity for developing countries to meet social needs. As in every country, the Venezuelan higher education system has been impacted by technology and the processes of economical and cultural globalization. Several Venezuelan universities (i.e. 38% of the universities) have taken important steps in the development of virtual academic programs in order to face these changes and deliver the needed results to society. Most of the virtual programs are in their experimental phase, and few universities have consolidated such programs.

The interest in virtual education programs has started mostly from the faculty toward the administration. Venezuelan universities reported that the faculty's resistance to change, as well as the little motivation that administration has given to faculty, are some of the problems that the virtual programs face. The success of virtual programs widely depends on the support the administration gives to them. The administration must embrace the philosophy of virtual education, invest in the programs, motivate the faculty, and recognize the work of the people involved in the development.

In addition to faculty issues, the costs related to technological infrastructure pose some problems in the development of virtual programs. Venezuelan official universities highly depend on resources from the State and the current economical crisis of the country might slow the development of virtual academic programs in this sector. The insertion of technology is usually accompanied by major changes in the organization, and in the short term will lead to high costs of investment (Bates, 2000). Nonetheless, the current Venezuelan government seems to have given more value to higher education by incrementing the assigned budget to this sector, by creating the Ministry of Science and Technology, and by working on a Law of Higher Education.

Finally, one can conclude that the future of virtual higher education in Venezuela is promising. The global impact that technology has had in education, the support of international organizations like UNESCO, the interest of the Venezuelan government in higher education, the efforts currently made by the universities, and the initiatives of university's faculty can all be seen as indicators toward the success of virtual higher education programs in Venezuela.

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Using Simple JavaScripts to Create Custom Hypermedia Flashcards

Anthony L. Palombella
Longwood University, Farmville, VA 23909

ABSTRACT
Step-by-step instructions are presented for the creation of hypermedia flashcards used for drilling and for developing higher order thinking. An image is shown on each flashcard, and moving the pointer to the proper areas of the flashcard reveals information about that image. Hypermedia flashcards may be viewed at random or in a particular order. Because any images, sounds, and written information may be used, appropriate flashcards can be designed for any educational level.

INTRODUCTION
There is increasing interest throughout academia for the development and implementation of multimedia or web-based teaching tools that can be integrated into the classroom. Despite this, many classroom teachers have neither the technical experience nor support to produce their own tools or adapt existing tools to their specific needs. In addition, many existing computer-based teaching tools are prohibitively expensive for classroom teachers. As part of an ongoing project to incorporate simple, effective, and inexpensive computer-based teaching tools into the curriculum, I present the creation and use of hypermedia flashcards (h-cards). H-cards are dynamic web pages that use simple JavaScripts to provide the basic features of paper flashcards, plus features impossible to include in traditional flashcards.

Making and using flashcards has been a standard study aid for generations. Despite the proliferation of textbook-style study guides, many students at all levels prefer flashcards as a way to keep up with important facts, terminology, and concepts. While use of flashcards has occasionally come under attack, especially for stressing memorization over comprehension (McCullough 1955), it has been shown that vocabulary flashcards are effective in improving both reading speed and comprehension (Tan and Nicholson 1997). In addition, comparisons of computer-based drilling and use of traditional flashcards showed no difference between the teaching methods as judged by test performance (Klein and Salisbury 1987). It is generally agreed that there is a strong positive correlation between how fun flashcards are to use and how effective they are as teaching tools (Nicholson 1998). It is in light of student interest in flashcards, their proven effectiveness, and the desire to make flashcards more fun to use that h-cards were developed.

H-cards have most of the advantages of paper flashcards. They can be examined at random or in a particular order. In online format, it is easy to add new cards to an existing set, and to correct any errors. In CD-ROM format, they are portable, and can be used wherever there is a computer, regardless of access to the Internet. H-cards also have features lacking in traditional flashcards. High quality images, including technical drawings, photographs and textbook figures (with permission) can be used. Animated figures, sounds, or any other electronic media may be incorporated into the cards. Also unlike paper flashcards, individual cards cannot be lost or damaged. Examples of student work (e.g., a student's drawing of the parts of a plant) can be included in the flashcards, adding a personal feel and sense of ownership that store-bought study guides cannot provide. Survey results and other student feedback show that students find h-cards

to be a fun and effective study tool, whether alone or as part of an organized active learning experience (A. L. Palombella and D. P. Johnson, manuscript submitted).

Getting started. A critical feature of h-cards is that they can be designed and created by individuals with no experience authoring dynamic web pages. The use of client-side JavaScripts to create the flashcard effects enables teachers to make fully functional flashcards independent of systems administrators or web-hosting personnel. Following the step-by-step instructions below, one can use three simple JavaScripts to perform the basic flashcard functions.

Rather than explain how to write JavaScripts, or even how they work, I present exactly how to use JavaScripts to create h-cards. By copying this information, and substituting your images for the images used here, you can create h-cards for your own purposes. You can use any standard Web-authoring software to make these cards. The example h-cards presented here were made using the Netscape-based Mozilla Composer. Mozilla can be downloaded for free from *http://www.mozilla.org/releases/*, and has versions compatible with Windows, Mac OS, Linux, and more.

Any standard Web-authoring software allows you to edit the HTML code that is the source for what you see in a Web page. The HTML code of a Web page is divided into two main sections. The "head" section is bounded by the code <head> and </head>. Every JavaScript will be written in this section. After the head section is the "body" section, bounded by <body> and </body>. It is in the body section that what actually appears in the published Web page is written. More importantly for now, the code that allows most JavaScripts to be activated is written in the body section.

Let's consider an example of a set of three h-cards. You will need a minimum of four Web pages. Give each of the three h-card pages an appropriate name, e.g., *card001.html*, *card002.html*, and *card003.html*. The fourth file is a home page (*card-home.html* here) that contains links to each h-card, plus a link to a randomly chosen h-card. The home page can include information about how to use the h-cards; for simplicity's sake, I've excluded those details from the example home page (Figure 1). I keep all the files in a single directory (*flashcards* in this example), with all image files in a subdirectory (*flashcards/images* in this example). An additional file, *random.js*, stored in the directory *flashcards*, is described below.

I use three JavaScripts to make h-cards. One creates a button that takes the user to a random h-card. Another allows for the so-called "mouseover effect," in which an image changes depending on whether the pointer is on it. The third speeds up the mouseover effect. Let's look at the JavaScripts one by one.

Shuffling the deck. The first JavaScript allows a random h-card to be chosen, the equivalent of shuffling paper flashcards. The random-choice JavaScript has two parts. The first generates a random number that tells the browser to navigate to a particular h-card. The second part puts a button on your h-card that lets users activate the random-number generator.

The random-number generator is kept as a separate file, *random.js*, which you can make with any word processing program. Figure 2 shows *random.js* for a set of three h-cards. Having a single *random.js* file simplifies adding h-cards to the set. The code

```
<script language="JavaScript" src="random.js">
</script>
```

is written in the head section of each h-card page, allowing that page to access *random.js*. In the body section of each flashcard, the code

```
<input type="button" name="myButton" value="Random Choice" onClick="rand_link()">
```

creates a button labeled "Random Choice" that picks a random h-card.

Turning the card over. The second JavaScript allows the mouseover effect that shows the "back" of the card. This JavaScript also has two parts. In the head section of each h-card, the following code creates the effect:

```
<script language="JavaScript">
<!-- This script and many more are available free online at -->
<!-- The JavaScript Source!! http://JavaScript.Internet.com -->
<!-- Begin
function movepic(img_name,img_src) {
document[img_name].src=img_src;
}
// End -->
</script>
```

Use the following code in the body section of the h-card where you want the mouseover area to appear.

```
<a href="#stay"
onmouseover="movepic('button','images/image02.jpg')"
onmouseout="movepic('button','images/image01.jpg')" name="stay"> <img name="button"
src="images/image01.jpg" border="0"></a>
```

Image01.jpg is the image that is the "front" of the h-card, the part you see at first; *image02.jpg* is what you see when the pointer touches the image. In Figure 4b, *image01.jpg* is an image with the words, "What am I?" *Image02.jpg* has the answer to the question (Figure 4c).

There are two things worth noting about this code. First, *src="images/image01.jpg"* ensures you see the question first, not the answer. Second, in some versions of Netscape and other browsers, this effect won't work unless the mouseover image contains a hyperlink. To overcome this limitation, I gave the button the name "stay" and set the hyperlink to navigate to the button itself. In other words, the hyperlink exists, but it doesn't go anywhere. By changing what comes after *<a href* =, you can link each flashcard to additional information on the topic of the h-card (see "H-cards and active learning," below).

Preloading images. The third JavaScript preloads *image01.jpg* and *image02.jpg*, speeding up the mouseover effect. This JavaScript has only one part, located in the head section of the h-card:

```
<script language="JavaScript">
<!-- This script and many more are available free online at -->
<!-- The JavaScript Source!! http://JavaScript.Internet.com -->
```

```
<!-- Begin
image1 = new Image();
image1.src = "images/image01.jpg";
image2 = new Image();
image2.src = "images/image02.jpg";
// End -->
</script>
```

Finishing the card. With the JavaScripts in place, there are only a few steps left to making an h-card. First, insert an image of the subject of the h-card (e.g., a picture of a flowering dogwood tree; *images/org001.jpg* in Figure 4). Next, change the names of image files in the JavaScripts so that they reflect the subject of the h-card. In Figure 4, for example, *images/image02.jpg* is replaced with *images/dogwood.jpg*. Finally, I include links to "previous card" (except on the first card), "next card" (except on the last card), and "home page" on each h-card. Figure 3 shows the source code for *card001.html*. Figure 4 shows how that h-card appears in a Web browser.

Adding more cards. If you add a fourth h-card to the set, edit *random.js* to pick a random number between one and four (change **3* to **4*). Likewise, the line *if (a==4) go_to("card004.html");* must be added to allow the new card to be randomly chosen.

Collecting images. Whenever possible, I create my own images for our h-cards. The picture of the bark, leaves, and fruit in Figure 4 was taken with a digital camera. The picture of the flowers in the same figure was taken with a flatbed scanner. The images were cropped and compressed (to reduce the time it takes for them to appear in a browser) using Adobe Photoshop Elements 2.0. I also use Photoshop Elements for the mouseover images.

Copyrighted images, of course, should not be used without permission. Many Web sites give instructions on how their images may be used. To use figures from a textbook, check with the publisher. The publishers I have contacted have given us free access to their images provided they are password-protected. Gatekeeper (http://www.pagetutor.com/keeper/index.html) is an easy-to-use JavaScript that provides password protection for Web pages.

Extra features. There are many features that can added to h-cards. I include two mouseover areas on field-identification h-cards, one for the common name, and one for the scientific name. For large sets of h-cards, I include a JavaScript that allows users to search for particular h-cards (Wagner, et al. 1996). Also, keep an eye out for opportunities to involve students in creating h-cards. Images of student work lend themselves to inclusion in flashcards. Several students have told me that the possibility–or guarantee–that their work would be used as a study tool for other students inspired them to do better quality work.

Flashcards and active learning. H-cards can be used as a starting point for many active learning experiences. In field botany, for example, each student must be able to identify approximately 200 species of plants found in our state. I gave students a collection of 130 h-cards of woody plants and a set of 15 h-cards of ferns. Each student used the information in the h-cards to deduce the identity of plants observed in the field. The ability to recognize plants in the field depended less on rote memorization of pictures than on understanding what parts of the

pictures were defining features of the plants. If, for example, we came across the tree shown in Figure 4, I'd ask a student to identify it and explain how the answer was obtained. The arrangement and venation of the leaves is sufficient to identify the tree as a dogwood, *Cornus* sp. The presence of showy white bracts means it is either the native flowering dogwood, *C. florida*, or the introduced *C. kousa*. The shape of the bracts and the distinctive bark is found only in *C. florida*. Thus, by actively working through the process of identification, the students were displaying more sophisticated knowledge than just the "answer" on the flashcard.

In a cell biology class, students used a set of 60 amino acid h-cards as a starting point for critical discussions and additional activities. They were required to match an amino acid's name with its one- and three-letter abbreviation, its structure with its name, and its name with its side-chain type (acidic, basic, uncharged polar, or nonpolar). In addition to rote memorzation, students had to explain why a side chain has the chemical properties it does; here, the students used the combination of pictures and labels on the h-cards to deduce information not actually written on the cards. Finally, each student wrote a report about a given amino acid, and these reports were accessible by clicking on the mouseover area of the appropriate h-cards.

Student assessment. Response to the various sets of h-cards has been overwhelmingly positive. A group of 59 biology majors, mostly freshmen, used a set of 67 h-cards depicting local wildlife as a study aid for an exam. On a scale of one to five (five being best), every student rated the effectiveness of the h-cards in improving their performance on the exam (compared to their performance on similar exams for which no h-cards were provided) as four or five (average = 4.91). Those who added written comments (n = 19) restated that the cards were very helpful, and expressed interest in using similar flashcards for other classes. Many students commented that they were fun to use. Equivalent results were found among field botany students (graduate and undergraduate) who used the woody plant flashcards. Students were required to be able to identify in the neighborhood of 100 different woody plants, and a similar number of wildflowers. In addition to classroom and field work, students had standard field guides and identification keys for both woody plants and wildflowers. Students were provided with h-cards of woody plants, but not of wildflowers. By the end of the course, it was obvious that the students learned to identify woody plants much more quickly than they could identify wildflowers. When surveyed about ways to improve the course, the most common recommendation was to include h-cards of wildflowers. It is worth noting that the h-cards used in this course were most effective when large number of cards were involved. A set of 15 fern-identification h-cards provided no noticeable advantage to students when compared to how quickly they learned to identify a similar number of mosses for which no flashcards were provided; in this case, most students made their own paper flashcards to learn mosses.

One less formal indication of the popularity of h-cards is that students frequently ask us whether we're developing new sets. Many students, especially those who intend to become teachers, have expressed interest in learning to make h-cards themselves. I have received numerous requests from former students, and teachers at all levels for either h-cards or instructions for making them.

Conclusion. I find h-cards to be a popular and versatile addition to a wide variety of introductory and advanced courses. The use of client-side JavaScripts means that h-cards can be used regardless of Internet connectivity, and put onto CD-ROMs. People with no formal training in computer programming or Web page design can make h-cards using free software and inexpensive cameras and scanners. Students like using h-cards, and they enjoy having their work associated with them. Most importantly, students use the h-cards to improve their classroom performance.

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FIGURE LEGENDS.

Figure 1. The file *card-home.html*. A. The HTML code for the Web page. B. How the page appears in the browser.

Figure 2. The JavaScript file, *random.js*. This file is stored in the directory *flashcards*. As written, this works for three flashcards.

Figure 3. **The HTML code for Card001.** The parts shown in bold are specific to Card001; the rest is the same for each flashcard. Subsequent cards should also include a "previous card" link.

Figure 4. Card 001 as it appears in a browser. A. The entire page; B. The "mouseover" area while the pointer does not touch it; C. The same area while the pointer touches it.

FIGURE 1a

```
<html>
<head>
  <meta http-equiv="content-type"
 content="text/html; charset=ISO-8859-1">
  <title>Flashcard Homepage</title>
  <script language="JavaScript" src="random.js">
  </script>
</head>
<body>
<div style="text-align: center;">
<h1>Flashcard<br>
Home Page</h1>
|  <a href="card001.html">Card 001</a>  |  <a href="card002.html">
Card 002</a>  |  <a href="card003.html">Card 003</a>  | <br>
<br>
<input type="button" name="myButton" value="Pick a Random Card"
 onclick="rand_link()"> <br>
</div>
   <p align="center" style="color: rgb(0, 0, 0);"><font face="Arial"><fontsize="1">
Free JavaScripts provided<br>
by <a href="http://javascriptsource.com">The JavaScript Source</a>
</font></p>
</body>
</html>
```

FIGURE 1b

FIGURE 2

```
<!-- This script and many more are available free online at -->
<!-- The JavaScript Source!! http://javascript.internet.com -->

<!-- Begin
function go_to(url) {
window.location=url;
}
function rand_link() {
var a;
a = 1+Math.round(Math.random()*3); // a = random number between 1-3.
if (a==1) go_to("card001.html"); //Change number after * for more cards.
if (a==2) go_to("card002.html"); //Add more "if (a==" for more cards.
if (a==3) go_to("card003.html");
}
// End -->
```

FIGURE 3

```
<html>
<head>
  <meta http-equiv="content-type"
 content="text/html; charset=ISO-8859-1">
  <title>Card 001</title>
  <script language="JavaScript" src="random.js">
  </script>
  <script language="JavaScript">
<!--This script and many more are available free online at-->
<!--The JavaScript Source!!http://javascript.internet.com-->
<!--Begin
function movepic(img_name,img_src){
document[img_name].src=img_src;
}
//End-->
  </script>
  <script language="JavaScript"></script><!--This script and many more are available free online at--><!--Th
JavaScript Source!!http://javascript.internet.com--><!--Begin
image1=newImage();
image1.src="images/image001.jpg";
image2=newImage();
image2.src="images/dogwood.jpg";
//End-->
</head>
<body>
<div style="text-align: center;"><input type="button" name="myButton"
 value="Pick a Random Card" onclick="rand_link()"> <br>
<a href="card002.html"> Next Card</a><br>
<a href="card-home.html">Flashcard Home</a><br>
<img src="images/org001.jpg" title="" alt="org001"
 style="width: 606px; height: 278px;"><br>
</div>
<div style="text-align: center;"> <a href="#stay"
 onmouseover="movepic('button','images/dogwood.jpg')"
 onmouseout="movepic('button','images/image001.jpg')" name="stay"><img
 name="button" src="images/image001.jpg" border="0"></a> </div>
</body>
</html>
```

FIGURE 4a

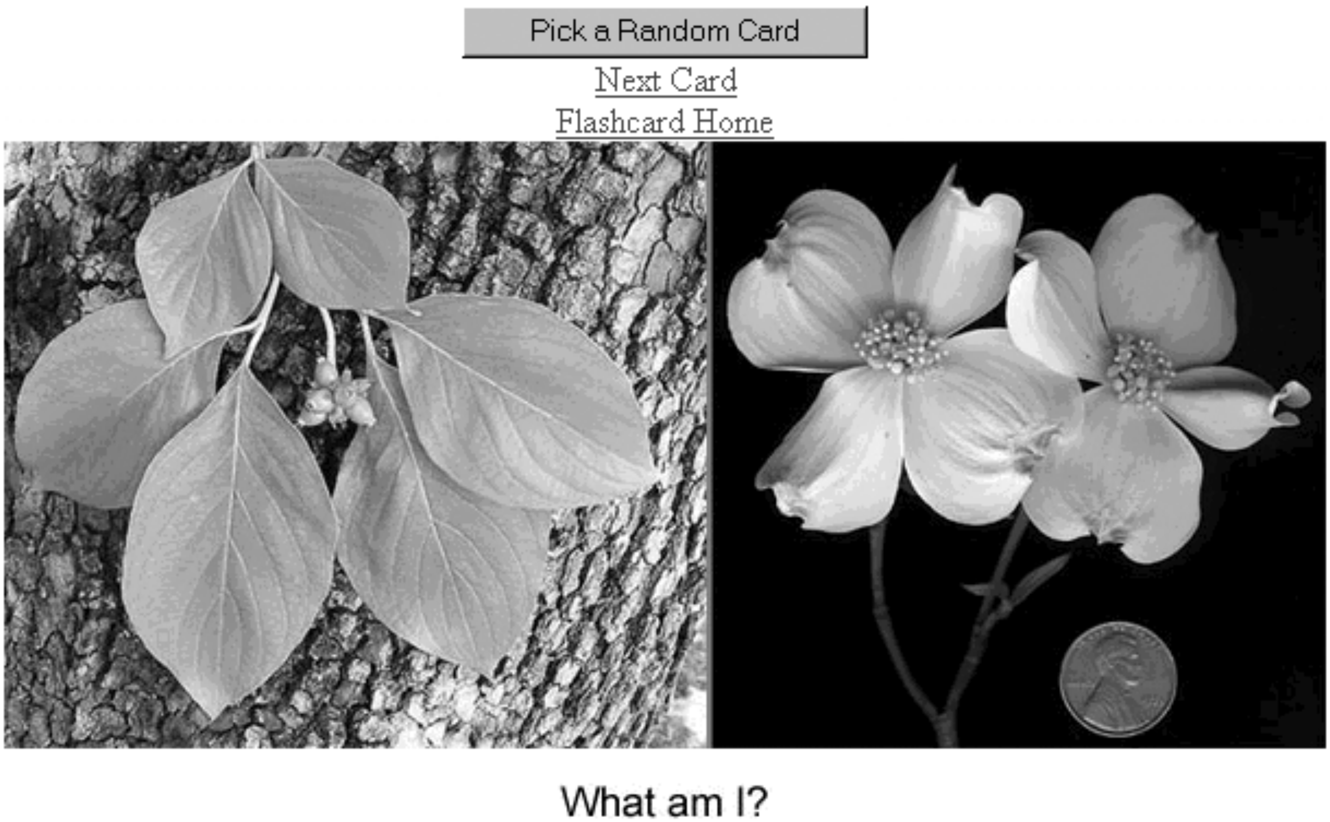


FIGURE 4B

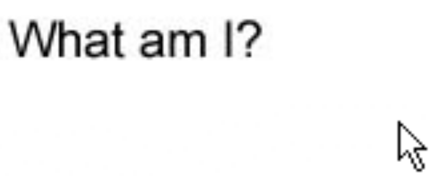
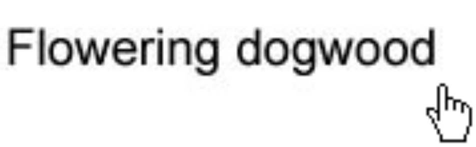


FIGURE 4c



TIPS AND TRICKS FOR TEACHING ONLINE: HOW TO TEACH LIKE A PRO!

Kaye Shelton
Dallas Baptist University
George Saltsman
Abilene Christian University

Abstract

This paper summarizes some of the best ideas and practices gathered from successful online instructors and recent literature. Suggestions include good online class design, syllabus development, and online class facilitation offering hints for success for both new and experienced online instructors.

Teaching online is a little like gardening. Students, like plants, need a healthy and fertile environment if they are going to mature and thrive in their online courses. It takes planning, preparation, hard work, and enough knowledge to know what to do (and what not to do) in order to see the labor yield an abundant harvest. Online instruction is new to many instructors in higher education, and for good reason. In just the last few years, it has grown from an academic experiment to a recognized distance learning modality. In fact, even traditional classes have embraced many of the teaching methods online education has popularized.

Because of this relatively new instructional methodology, many online instructors may feel a bit like a novice gardener. They understand the basic concepts, but are eager to discover new tips or tricks from fellow colleagues. In most cases, if two or more online instructors are together in a social situation, the discussion will soon shift to war stories and proudly offered pieces of advice. This paper offers many of those tips and tricks, gathered not from the local Sunday afternoon garden club, but from conversations and interviews with online instructors, current literature, conferences, and email listservs, along with personal experiences.

Teaching online shares similarities to teaching in the classroom; however, even the best traditional instructors may still find that teaching in an online environment can lead to feelings of inadequacy and being ill-prepared. Providing training and tools for ePedagogy is the key to overcoming feelings of insufficiency. Preparation is needed to instill instructor confidence as well as create successful outcomes in the online classroom. Even experienced online instructors will find helpful and timesaving ideas from tips shared from other instructors.

VanSickle (2003) recognized that the new online instructor should understand how the Internet has changed student expectations. These student expectations, described by Lansdell (2001), included increased levels of feedback, increased attention, and additional resources to help them learn (as cited in VanSickle, 2003). In response to meeting these expectations, new and alternative methods of instruction and online class facilitation have evolved which support student cohesiveness as well as encourage learning. To successfully challenge the online student, an increased amount of communication is required between the instructor and the student (White, 2000).

Multiple methods for online instruction are utilized throughout academe. One method, commonly described as the online learning community approach, has become preeminent in online instruction. Boettcher and Conrad (1999) define an online learning community as a community that "consists of learners who support and assist each other, make decisions synergistically, and communicate with peers on a variety of topics beyond those assigned" (p. 88). For this paper, the following is assumed of the online course:

- The course meets online during a regularly defined semester or quarter.
- The course is broken up into learning modules or content chunks.
- Student participation is required within a set time period – each content module is presented with a given start and end time.
- Learning takes place as students synthesize the prepared material and interact in the class discussions with peers and the instructor(s).

Four stages are necessary for successful gardening and four stages are necessary for successful online teaching. A good gardener will prepare the soil for planting early; sow the seed; nurture the seedling to maturity, then harvest the crop reflecting on a productive season. A good online instructor will follow the same basic path: develop and structure the learning environment, introduce the material, encourage academic and intellectual growth, and finally, evaluate the effectiveness as he/she watches the students depart with an understanding and appreciation of the subject that will hopefully remain with them for a lifetime.

Preparing the Soil—Develop and Structure the Learning Environment

The first step in online instruction occurs long before the seeds are planted. It takes significant planning and preparation as Brewer, DeJonge, and Stout (2001) suggest, how the online course is designed "can either facilitate or impede the learning process" (p. 12). Much of this groundwork centers on designing the course syllabus. Preparation of the syllabus enriches the soil, providing a fertile and prepared environment for learning to occur.

Within the syllabus, student expectations should be clearly defined along well-written directions relating to course activities. Ko and Rossen (2004) relate the syllabus to a course contract and observe that new online instructors do not include enough information in their syllabi. These expectations should be stated in the opening orientation material as well as in the course syllabus. The preparation includes clearly defining these elements within the syllabus: contact methods, course objectives, attendance requirements, late work policies, the course schedule, orientation aids, grading scales and rubrics, communication practices, and technology policies.

Contact Information

Of course, the typical items should be included in the syllabus such as office times, contact information, and preferred modes of contacts. However, unlike a traditional course, instructors should be very clear about online office hours or hours of unavailability. For instance, if church attendance on Sunday mornings occurs regularly, it would be appropriate to inform the students in the syllabus of the offline time on Sunday mornings. Boettcher and Conrad (1999) suggest that an online instructor not be available twenty-four hours a day to the student but to establish a framework for turnaround response. This framework should offer recommendations for how long a student should expect to wait before repeating an email request that has gone

unanswered. Jarmon (1999) also states that instructors should set the expectations for the students regarding response time and let the students know how quickly to expect a response.

On the other hand, if there are times the instructor will definitely be online, he/she could include a "fastback" time or online office hours. A fastback time is a time period when students can expect a quicker than normal email response, usually within the hour, but often as soon as the message is received. Many instructors offer online office hours where they enter into the class chatroom and wait for questions. It is often reported by instructors that students underutilize this time, choosing to send email as their questions arise, rather than waiting until a prescribed time in the future. An alternative to the using virtual office hour time for academic questions can be to use the room for social conversation. A virtual social experience helps create a closer bond with both the instructor and with others with in the course, furthering the strength of the learning community. This is a form of the "cyber sandbox" described by Palloff and Pratt (1999). The cyber sandbox is defined as a generic discussion or bulletin board area for students to just hang out and talk about movies or jobs or whatever their interests are. The creation of a social outlet not only helps to keep regular class discussion areas on topic, but Palloff and Pratt (1999) observed that "the sharing of our lives, including our travels, our observations, our emotions, and who we are as people is deliberately brought into the classroom in an effort to promote group cohesion and connection" (p. 78).

Course Objectives

Well-defined course objectives are an important element in any course syllabus. Clearly stated objectives are even more important in online courses as students do not have the opportunity to participate in the opening day syllabus discussions so common in many traditional courses (Jarmon, 1999). The communication of course objectives is also important because in an online course, much of the responsibility for learning is placed upon the student. Failure to properly inform the student of the course objectives leaves them feeling confused and puzzled about where each assignment, and moreover, the entire course is headed.

Attendance Requirements

Attendance requirements should be clearly stated, as attendance is necessary for courses that utilize online learning communities. Palloff and Pratt (2001) advise, "If clear guidelines are not presented, students can become confused and disorganized and the learning process will suffer" (p. 28). The online learning community requires that students take active roles in helping each other learn (Boettcher & Conrad, 1999). If a student is absent, they have not only cheated themselves but also those in their learning community.

Participation requirements must be defined for an online course. Ko and Rossen (2004) recognize "if students aren't graded, the majority won't actively participate" (p. 67). Some students think that if they take an online course, they can take a vacation and still catch up with their coursework upon their return or do a few modules ahead of time before they leave. While online courses do allow for flexibility, students must participate. So if instructors want good participation, the participation requirements must be identified. Students may ask if they can post ahead of the other students or take the course on a self-paced schedule. Because of the prevalence of this question, online instructors should have a policy regarding early posting and have it clearly stated in the syllabus.

Participation in online courses is inherently different from traditional courses. Students do not automatically understand how to participate in online courses. Course assignment and participation requirements should be thoroughly discussed in the syllabus as well as within the assignments themselves. Where possible, assignments should be grouped into categories to help provide context to the nature of the assignments. These categories often include class discussion, web searches, quizzes, and reading assignments, etc. A good suggestion is to identify each type of assignment with consistent icons. Some online instructors have found that creating a sample discussion model increases students' understanding of the participation requirements necessary for credit in the course.

Late Work Policy

The instructor should create a policy for late assignment submissions and missed exams. Again, students who are not actively participating in the learning community are not assisting other students. Because of this interdependence, many instructors have a "no late work accepted policy," while others assign reduced or half-credit. Other instructors create alternative assignments or exams for past due work or tests. To facilitate ease of grading, these alternative assignments could be offered at the end of the course for all those who missed assignments during the normal time period.

Course Schedule

One of the most important elements of an online course syllabus is the course schedule. The course schedule should list beginning dates and due dates for each module, the assigned reading, the assessment, and other activities. The course schedule becomes the map for the student and should be placed in the course syllabus, inside the course material, and redundantly throughout the course. In fact, Ko and Rossen (2004) recommend, "In an online environment, redundancy is often better than elegant succinctness" (p.76). If the website or course management system allows linking from the syllabus, then link each module of course content to the course schedule making it readily available to the student. Instructors should provide the course schedule in a printable format along with a digital format. Students should be encouraged to print out their course schedules and keep them handy.

Along with the course schedule, each module of content should contain a checklist for the student to use for objective completion. This should also be print ready, as some students need to print their materials and read them offline. Course content that presents an easy to find and understandable assignment checklist will save numerous emails from students inquiring about due dates and pleas for deadline extensions.

Orientation Aids

An orientation note or hints for success for the student should be written and available for the student (Jarmon, 1999). This is a note for the student, reminding them of hints for time management or and good study practice. Another helpful suggestion is to create a Frequently Asked Questions (FAQ) area for students to use in locating self-help answers to questions (Jarmon, 1999). This allows the students to look for information first before emailing the instructor. As questions are asked over time and as answers are provided, a comprehensive FAQ will emerge. McCormack and Jones (1999) suggests the FAQ page could not only "reduce the

number of questions at the start of the semester" (p. 2) but throughout the duration of the course. If a chatroom is used for virtual office hours, the questions discussed should also be added to the course FAQ.

Grading Scales/Rubrics

Grading scales and rubrics should be defined for each assignment. If the courseware management system allows, each assignment could be linked to the rubric for clarity. When group assignments are utilized, instructors should use a grading rubric for the students to grade each other individually as well as the entire group. This helps encourage those students who do not participate equally and provides for equity in the grading of group work. It is also helpful if the instructor assigns groups or teams the first time. The class should get to know each other before group self-selection is allowed.

Communication Practices

An inbox consistently full of email will be overwhelming to any instructor. Therefore, it is important to include in the syllabus elements for class behavior, guidelines for posting to the discussion boards, email protocols, and digital file submission procedures. Establishing email protocols and other communication guidelines will assist the instructor in online classroom management. Many instructors require the course session number in the subject line so that the email related to the course can be filtered to a separate mailbox. Students may be asked or required to use their institutional email address so that instructors are not confused by changes in address mid-term or are required to deal with bounced mail from full inboxes on students' free email accounts.

An instructor can create individual email sub-folders for each of the online students. Once email has been answered and or graded, the email can be filed away immediately providing for a record of all course correspondence. Another tip for instructors is to read their mail backwards, from newest received to oldest. In many cases, students may have already solved their problems and earlier questions then become irrelevant.

Technology Policy

A technology policy should be stated in the syllabus that directs students to a helpdesk or other resource other than the instructor for technology problems. Additionally, instructors should encourage students to create drafts of postings or assignments in a word processor and save them before posting to the discussion board. This will minimize spelling and grammar mistakes and provide a backup copy for the student in case of a technical glitch during posting. It is also a good idea to encourage students to save all of their work on a computer hard drive and to a removable device, such as a floppy disk or USB drive. Saving their work to a USB flash drive allows the student portability if their systems go down. They can then take their files with them and use the computer of a family member or friend, or any publicly accessible computer, such as libraries or cybercafes, in the event of a technical problem at their home.

Sow the Seed – Opening the course

The second step for successful online teaching is opening the course and the initiation of instruction. An enthusiastic and engaging opening week of class is a great way to start off the course. This time of seed germination is a fragile period; disruptions or unnecessary interferences may set a tone that stifles learning during the remainder of the course. It is important to create a good initial impression that will help develop the learning community and begin to nurture the students to maturity. This opening of the course is highlighted by sending a welcoming email and announcement, initiating class-wide introductions, encouraging students to read the syllabus, and establishing a tone of excellence.

Welcome Email and Announcement

Moore, Winograd and Lange (2001) offer several tips for the first session of class: send a welcome email that invites the students to join the class, telephone students who don't appear in the classroom the first week, and duplicate your welcome email in a class announcement if the course management system offers this ability. The announcement should encourage students to check their email for the initial course email of welcome. The first week should not require many assignments but allow the time for students to post introductions and get to know each other. Any technical issues should be dealt with immediately, including offering access to helpdesk support if available.

Introductions

The instructor should spend time getting to know the students individually the first week of class and encourage the students to do the same. An introductory discussion inviting the participants to introduce themselves and to share something in particular with the group is a successful strategy for building the learning community. The instructor should participate heavily in this discussion (being careful not to dominate it) and should respond to one or two things in the introductory posting of each student. Ko and Rossen (2004) suggest the "initial postings in the discussion forum, your first messages sent to all by email or listserv, or the greeting you post on your course home page will do much to set the tone and expectations for your course. These 'first words' can also provide models of online communication for your students" (p. 189).

Offering an icebreaker in the first session, such as "share your silliest moment in college" or "name the animal you most identify with," can help alleviate the nervousness students experience and provide insight relating to the personalities of their fellow students. Several good icebreakers that also provide an instructor with a basic student learning inventory include the VARK learning styles (http://www.vark-learn.com/english/index.asp) and the Keirsey temperament sorter (http://www.keirsey.com). The Kingdomality profiler (http://www.kingdomality.com) provides not only a Medieval vocational assessment but also is fun and generates discussion possibilities. Each of these websites offers instant results, and the students can post their results and a short paragraph if they agree or disagree. Countless other sites allow students to discover their commonalities and similarities as well and can be found with a simple Internet search.

Emphasize the Syllabus

A great hint for the first session of class is to create a syllabus quiz or scavenger hunt that "teaches students how to navigate your course" (Schweizer, 1999, p. 11). Then, offering bonus points to assess syllabus comprehension is a successful way of engaging the student in the first session of class. Encouraging students to review the syllabus in a more thorough process can alleviate confusion later in the course as they familiarize themselves with the course requirements.

Establish a Tone of Excellence

The first several weeks also set the tone for academic participation. Instructors should grade discussions/assignments stringently in the first few assignment cycles. Establish a tone of excellence early and encourage students to do their best. "Students want to receive timely and personal feedback" (Boettcher & Conrad, 1999, p. 97) early in an online course. They may not be able to assess their progress as easily online as they would in a traditional course (Boaz, 1999). It is also helpful to remind the students of these expectations throughout the course. It is always easier to lessen the workload later than to increase it.

Nurture the Growth – Nurturing the Learning Community

The third step of teaching online is to nurture the learning community. The learning community must be established and then become self-sufficient. The learning community, like a garden, must be cultivated. This cultivation occurs when an instructor provides ample communication, facilitates the discussion board, treats each student as an individual, adds emotion and belonging, responds quickly to questions, models required behavior, creates appropriately sized groups, and clearly outlines expectations for group activities.

Provide Ample Communication

Online students are eager for communication. Lack of instructor-student communication early on will create a negative learning community thus disabling the learning process. Instructors should use class-wide announcements, group emails, and chat archives to facilitate accessible, public communication in the online course. As the course grows, students should be encouraged to facilitate the discussion and assume some of the roles previously controlled by the instructor.

Communication must be both reflective and proactive. Many courses use class-wide journals or summaries to bring closure to modules. Sending out class-wide summation/introduction/transitional emails at the end of each module, wrapping up the previous content, and introducing the next module provide for a sense of transition. Reminding the students of requirements for the current module, such as projects or exam dates, is very helpful to the students. It takes about ten minutes a week for either of these tasks, yet the benefit provided is far more valuable. Proactive communication yields fewer questions, saving dozens of hours answering the questions individually.

Instructors should keep their interaction with the class as open as possible. Using the "Course Announcement" area frequently for reminders and duplicate important information in emails will increase open communication. It is also important to communicate to the class each time grades are posted. This creates a "don't call me, I'll call you" communication pattern for

grade information. Within that communication, remind students to contact the instructor if a grade is missing. This puts the responsibility back with the student for finding and submitting any missing work.

Facilitate the Discussion Board

Bischoff (2000) suggests, "The key to online education's effectiveness lies in large part with the facilitator" (p. 58). Likewise, for the threaded discussion to be successful, the instructor should become a facilitator and review the discussions without controlling them. Many online instructors have found what many gardeners realize: at times, hands-on action produces results but in many cases, too much activity can be as harmful as none at all. This particular role of the facilitator in the online classroom can be difficult for a traditional instructor to accept. A traditional instructor may be accustomed to dominating or controlling the discussion through lecture, but in an online class, all students have equal opportunity to participate in the discussion and often do outside of the instructor's influence. It takes a good deal of time for some traditional faculty to feel truly comfortable in allowing the discussion to take place outside the classroom and without their intervention, but that is fine—experience will eventually guide them.

For good discussion board facilitation, the instructor should randomly and selectively reply to students and provide prompt explanations or further comments regarding the topic of discussion. The instructor or facilitator should provide feedback in the discussion even if it is merely a "cheerleading" comment, redirection, or guideline submission. The instructor should intervene when the discussion seems to be struggling or headed the wrong way (Palloff & Pratt, 2001) but should not over-participate in the discussion, as this will be considered stifling and restrictive. However, the instructor should prompt absentee students or "lurkers" with an outside communication, whether it is a gentle reminder email or a telephone call. According to Bischoff, (2000), "A phone call may prove more timely and effective" (p. 70) in helping a student engage in the discussion.

Many instructors will assign assistant facilitators and summarizers for each discussion session, providing different opportunities for student involvement. Other instructors use "coaching teams" made up of students or tutors as the first line of support, then invite the students to ask the instructor for clarification or further assistance. If good online facilitation of the discussion does occur, the "discussion will end in acceptance of different opinions, respect for well-supported beliefs, and improved problem-solving skills" (Brewer, DeJonge, & Stout, 2001, p. 109)

Treat Each Student as an Individual

All instructors should try "to treat their students as unique" (White, 2000, p.11). A simple technique is to use the students' preferred names or nicknames in all correspondence. It is also important to try and add positive emotion and visual clues to the course. The online environment can be limiting when the communication is mostly text-based. This serves the same purpose as nodding a head in agreement or offering a welcoming smile as would occur in a traditional course.

Add Emotion and Belonging

When online learning is facilitated incorrectly, the students can feel isolated and cheated out of a valuable learning experience. This could lead to feelings of separation and disappointment and would probably hamper the success in learning. White (2000) advises that "a positive emotional climate can serve as a frame of reference for online students activities and will therefore shape individual expectancies, attitudes, feelings, and behaviors throughout a program" (p. 7). Since there are no visual clues in the online classroom, one suggestion for communication is to type out the emotion expressed in parentheses (*smile*) or to include emoticons, such as **:-)** for happiness or **:-0** for surprise or dismay. It is also possible to describe you body language in the email. Salmon (2002) offers this example: "When I read your message, I jumped for joy" (p. 150). This descriptive effort shows the students the instructor's personality, which in turn, stimulates the online community. It is also beneficial, as Hiss (2000) suggests, for online instructors to keep their sense of humor.

Respond Quickly

Time delays in a threaded discussion can also be frustrating for students. This is especially true if the response was misunderstood and the students have attempted to clarify. Online instructors should try to post daily or at least on a regular schedule that has been communicated the students. Some instructors create homework discussion threads for content support, which provides a forum for students to help each other.

Model Behavior

Instructors, who want to engage students in collaborative group work, must first understand that certain social skills are necessary for successful group work. These skills can be established at the onset of the course when the learning community is formed and students recognize that the online classroom is a safe place to interact. These skills should be modeled by the instructor early in the course and outlined in the course syllabus. For example, if a two paragraph introduction is expected, then the instructor should model that in their own introduction to the class in the opening discussion.

Create Appropriately Sized Groups

Most students enjoy the online social interaction and find that it encourages their learning experience. Independently minded students may even enjoy working within the group because of the asynchronous nature of the course and may participate more readily than in the face-to-face classroom. In creating the groups, Ko and Rossen (2004) recommend that instructors divide students into groups instead of allowing students to pick their own groups. Students may find it difficult to meet online and form groups quickly. Many instructors search through the introductory material looking for commonalities among students for grouping. Finding common elements such as a love for dogs or a shared hobby will help hasten the group cohesion.

The instructor should not make the group sizes too large or too small. The most effective group size appears to be four students per group. Utilizing these suggestions, the group work should begin easily as to promote as positive learning experience in the online classroom. The actual process for completing the project should be outlined by the instructor, but the final outcome should be the group's responsibility.

Clearly Outline Expectations for Group Activities

The instructor should offer a grading rubric (that is also stated in the syllabus) for both individual member grades as well as for overall group grades. Group collaborative suggestions in the traditional classroom are simply executed by having the students turn to their partners and share ideas. When this happens online, it is more difficult for students to initially set up the contacts because of the lack of proximity and familiarity with other students. Email communication makes this both possible and efficient in the online environment.

The following suggested activities for successful group learning were included in Heidi Schweizer's (1999) book *Designing and Teaching an On-line Course:*

- ***Group Identity*** – Ask the group members to create a group name.
- ***Which One is False*** – A group activity for which each member of the group is asked to come up with three statements about himself (two true and one false), share them with each other on-line and try to figure out which one is false. This serves as a fun way to get to know each other and begin to develop a more personal relationship.
- ***Assign Roles and Responsibilities*** – By assigning roles, the group begins to depend on each other to see the value of sharing the load.
    - **Encourager –** emails instructor on group cooperation.
    - **Summarizer** – writes up group decisions and edits group work.
    - **Checker** is responsible for checking on whether group members understand main concepts.
    - **Technician** is available to other group members for technical advice or assistance.

(p. 59)

Other suggestions for group work in the online classroom can include role playing, online debates, case studies with evaluation, and discovery roles in which the instructor sets up puzzles or open-ended questions for hypothesis.

Harvest—Plan For the Next Semester

The final stage of online instruction is assessment. To watch learning take place in the minds of students is a rewarding experience. It is why many instructors choose to teach in relatively lower paying positions rather than work in the more lucrative for-profit world. Just like gardeners in autumn, it is a time of reflection and satisfaction for a job well done. The tiny seeds sown early in the season are actively growing and producing. It is at this stage that instructors should evaluate the course objectives to be assured the students have accomplished each goal. What worked well and what needs to be improved for next season? This can be accomplished by keeping a journal and by soliciting feedback on instruction and on course content.

Keep a Journal

Self-examination and contemplative thought are successful approaches for course improvement. A recommended practice is to keep a journal while teaching a course that records items that should be redesigned or altered the next time the course is taught. The instructor should make notes of assignments that worked well and those that struggled while critically evaluating the effectiveness of the content and instruction.

Solicit Feedback on Instruction

Student feedback improves the instructor's teaching. A good place to gather the feedback is inside the course management system. It is helpful to survey for student feedback during the course, not just at the end with course evaluations. The instructor can develop a discussion thread for students to post feedback anonymously about the course, including possible suggestions for improvement. If a student does offer feedback, the instructor should acknowledge the feedback and be appreciative for the remarks.

Feedback instruments should provide the students with a way to communicate what they like the best and the least about the instruction of the course. If possible, mid-course changes in responses to students' comments will allow students to feel empowered through taking an active role in their education.

Solicit Feedback on Course Content

All online instructors should look for possible course revisions. Course content should never stay static. Moore, Winograd, and Lange (2001) propose that "because online course design and teaching are so new, evaluating the effectiveness of your course and then refining it based on the results of that evaluation become imperative" (p. 12.3). If using end-of-course summary feedback, the instructor must receive this feedback in time to reevaluate the course for the next semester and add suggested changes, if necessary. Another possibility is an end-of-session discussion regarding the focus of the next session, thus allowing for minor course revisions even as the course continues to be taught.

Conclusion

Online teaching has brought a new modality to education for teaching at a distance. It has also brought frustration and anxiety to the online instructors. Moore, Winograd, and Lange (2001) remark "One faculty member who had only just finished her course online said it was like diving into a great chasm, blindfolded" (p. 11.3). Instructors who are comfortable with the traditional methods for teaching in the classroom struggle to engage students over the Internet. While many of the same techniques apply, teaching online requires additional techniques for success. These techniques are similar to the same steps a gardener takes to develop a garden. In the online classroom, the ground is prepared with a carefully designed syllabus and policies, the seed is planted in the first session of class, and the learning community is nurtured to grow and become self-sufficient. These steps yield students who are engaged and working toward completion of the learning objectives. By utilizing these effective strategies for teaching online, an instructor will be successful in engaging the online learner, nurturing a successful learning community, and alleviating the frustration and fear that goes along with teaching online.

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Resistance to Training: How to Reduce Resistance to Training Proactively

Daniel M. Siegel
University of Central Florida

Abstract

Training and education often involve exposing learners and employees to new ideas and ways of performing daily activities. How can we as trainers, instructional designers, and educators be effective when the learners bring resistance to the classroom? Resistance takes many forms from passive resistance such as negative water cooler talk to aggressive resistance by disrupting class or refusing to accept new ideas and techniques. Many times, resistance to training can be overcome by taking proactive steps before the training is implemented. Issues of affective learner domains, implementation approaches, executive leadership, and corporate culture play a pivotal role in the success of the classroom. These factors can easily be shared with the corporations, public school classrooms, and military training. Learners are human beings with predictable patterns of resistance that can be addressed before the classroom setting to improve overall human performance factors.

Resistance to training initiatives is a major obstacle to corporate trainers and instructional designers throughout the business world. The literature review reflects the many challenges resistance poses to trainers and instructional designers and how this resistance interacts with numerous facets of training. The literature has been categorized based on limited to these in this paper, isn't it affective domains, corporate culture, company leadership, approaches to implementing training initiatives, and solutions to overcoming learner resistance. The paper will detail each factor and how it fosters or inhibits resistance and will describe interventions for the purpose of reducing resistance to training by respondents.

Why is it important?

Resistance is a manifestation of the inability to adapt to changes and new ideas. In today's rapidly changing business environment, the ability for a company to adapt is considered the main factor in its survival and competitive success (West, 1994). Learning the root causes of resistance to training and the differences in training perceptions by management and employees may provide significant support to training departments everywhere.

Resistance to training from employees is manifested in many ways including negative comments, absenteeism, disparaging anecdotal feedback, and other forms of passive or aggressive actions by despondent employees. This paper will describe the research related to training in the corporate culture. Training literature has focused on methods for shaping skills, attitudes and behavior at work through the enhancement of transfer and training to the work environment (Gist, Stevens, & Bavetta, 1991).

The biologist's understanding of organism behavior can contribute to this discussion. Learners are human organisms approaching the unfamiliar and uncomfortable environment of training. Biologists have confirmed the following about organisms:

- As an organism's environment becomes more complex and unpredictable; the organism must adapt and transform to survive.
- The organism's ability to develop a unique path of evolution is built upon an existing capacity.

In an environment of stress and tension, organisms develop new and unpredictable survival tactics (McLagan, 2002).

The process of adaptation and transformation is often painful. Training professionals must work to ease learner metamorphosis by recognizing learner attitudes and creating a positive environment. Too often, these important factors are overlooked. Trainers must recognize the causes of resistance when developing training initiatives. Kirkpatrick (1993) lists possible key causes of resistance to new training programs:

- Fear of losing their jobs, status, business contacts, or favorable working conditions
- Don't see a need for training
- Don't like the people introducing training
- Don't like the way the training was introduced
- Weren't consulted or personally informed about the training
- Don't understand the reasons for the training or feel it will do more harm than good
- Consider the training a personal criticism
- Think that the training requires too much effort or comes at a bad time
- Think that the training creates more responsibility and work
- Want to test the organization to see if they can avoid implementing training
- Have negative feelings about the organization or their particular job
- Have been negatively influenced by peers or leader of their peer groups

Recognition of the challenge is the first step toward finding solutions to resistance. Each area of research impacts trainers differently, depending on factors such as corporate culture and type of employee. Similar to the biologist's organisms, learners approach the unfamiliar and uncomfortable environment of training.

Affective Challenges

Trainers should develop curricula based on the needs of a company. Curricula are usually developed around a cognitive based skill development. Skill-based outcomes involve extend automaticity with which trained skills, attitudes and behaviors are exhibited after training (Birati & Tziner, 1999). Cognitive based training outcomes require significant in the learner. In many cases, this requires energy and commitment on the part of the learner. In order for cognitive based training to occur, the following types of knowledge must be addressed by the trainer: declarative knowledge, the acquisition of meaningful structures for organizing knowledge, and the development of superior cognitive strategies (Birati & Tziner, 1999). A major obstacle to corporate educators is the range, experiences, and learning of the target population. Trainers and Instructional Designers must increasingly align training with organizational goals and missions (Victoria J. Marsick & Watkins, 1999). Cognition is usually

not the primary obstacle when dealing with corporate training. Resistance is often caused from affective influences.

Emotions play a key role in blocking acceptance of information technology (McKenzie, 1998). The integration of technology is more about learner attitudes then skill knowledge (McKenzie, 1998). Affective based outcomes refer to training stated attitudes and motivating learners in the desired direction. The purpose is for the trainee to recognize the value of acquired knowledge and skills, attraction toward a learning outcome refers to trainings in stated attitudes and in motivation in the desired direction (Birati & Tziner, 1999).

Resistance to training starts with the employees of an organization. Employees, the human capital of the organization, are the key to achieving a competitive advantage. The impact of employee training and development on success and growth of the organization is consistently underestimated (Moonen, 2003). For these employees, learning and work time have become integrated. Corporations are depending on trainers, coaches, mentors, and self-directed learning activities. Learning includes desktop technologies and elearning. Trainers need to be versatile, flexible, and quick to locate needs and learner obstacles. Curricula must include increasing self efficacy and a willingness to exert effort in order to implement acquired knowledge/skills (McKenzie, 1998).

Learners experience a wide range of emotions that lead to resistance. Emotions include such feelings as fear, anxiety, anger, and resentment. For many of the techno-holdouts, emotions play a role in blocking acceptance of information technology (McKenzie, 1998). The following are questions that may come up that reflect resistance in training:

- What if I look foolish in front of my colleagues?
- What if I cannot make this program work?
- How long will it take before I feel like an expert?
- How do I fit this into my already crazy schedule and life? (McKenzie, 1998)

These are all questions that need to be answered by training professionals and corporate leadership before training occurs. The integration challenge is more about attitude and spirit than skill (McKenzie, 1998).

Corporate Culture

Environment plays a critical role in the implementation of training initiatives. The optimal corporate cultural environment would include the establishment of a learning organization. Marsick (1994) stated that “the learning organization is not a prescription, but rather a template for the examination of current practices…” (p.354). A learning organization should imply continuous learning and the development of potential in all the people who work with the company. Training should involve self-development of the company as a whole organization, including the integration of each individual’s learning with that of the company as a whole (Pedler, 1997). Garvin (1993) defines a learning organization as one that is skilled at creating, acquiring, and transferring knowledge. Success with training implementation usually occurs in a knowledge friendly culture with a reward system for sharing knowledge and innovations that utilizes strong communication channels (McLagan & Krembs, 1995).

The existence of corporate culture as an influence on training has been the focus of many academic debates. Sherriton (1997) describes the myths regarding the importance of corporate culture regarding resistance to training.

1. The first myth is that culture doesn't count.
2. The second myth is that culture cannot be trained by the training department.
3. The third myth is that training alone equals a corporate cultural training.
4. The fourth myth is that if you push for the training loudly and long enough then the training will occur.
5. The fifth myth is that culture is a continuing process and hence there is not need to include it in strategic planning.

Cultural trainings cannot be implemented until corporate leadership and training professionals recognize the type of organization with which they will be working. Goffee (2003) identify four types of organizational cultures drawn from the presence of two broad types of social relationships: sociability (friendliness) and solidarity (drive toward a common goal). The type of company in which a trainer works must be considered before implementing training. Each type will have vastly different levels of resistance. The four types of companies are:

1. Networked= high sociability and low solidarity
2. Mercenary= high solidarity and low sociability
3. Fragmented= low elements of both
4. Communal= high elements of both (Goffee 2003)

In changing the culture of a corporation, one key to success is to create a culture of accountability (R. Conner & Smith, 1999). For training to be successful, every employee must assume personal ownership of results in the organization and be committed to achieving. Conner (1999) defines culture as the way people think and act in certain groups and is the sum of people's beliefs and behaviors in that group. Conner states, "Good training creates an experience. The best training creates a powerful experience and that trainings people's beliefs and behavior, that is, the way they think and act. This enables them to produce better results (R. Conner & Smith, 1999 p. 37)."

Bartlett (1990) addresses the organizational psychology of resistance in the corporate culture by identifying three characteristics to encourage effective training implementation: clear and consistent vision of goals, linking individual employee perspectives to corporate goals, and the integration of individual activities in a broad corporate agenda. Quinn (1985) identified many barriers which create resistors toward training and innovation. The first resistor is isolation in the higher levels of management within the organization. Isolationism by leadership fosters misunderstandings and contributes to an environment that avoids risks. Intolerance of difference is another resistor, which contributes to harmful homogeneity and identifies those who question the status quo as troublemakers. Vested interests are a form of balkanization, which creates an "us" and "them" mentality within the organization. Divisions become turfs to be defended and any training to the division manager's fiefdom leads to resistance. Shortsightedness is another obstacle because it impedes the long term planning process. Overly rational thinking is another form of resistance that tries to place creative and chaotic processes into systemic and rational sequences and may emphasize schedules over greater development. Quinn (1985) also discusses inappropriate incentives that encourage managerial control and discourage innovation. Finally, Quinn details the dangers of excessive bureaucracy through

allegiance to rules and procedures that are designed to block new ideas and practices inside the organization.

Corporate culture training attempts have included some examples such as: restructuring, merging, reengineering, benchmarking, total quality management (TQM), diversity programs, 360-degree feedbacks, on-site daycare, and flextime (Juechter, Fisher, & Alford, 1998). For the corporate culture to be conducive to training, the three subsystems of "Why, what, and how" must be analyzed (Juechter et al., 1998). "Why" entails the reasons which the organization exists such as purpose, mission, and values. "What" describes what the organization does to pursue its mission and achieve its purpose through how it utilizes strategies, structures, systems, and skills. "How" details the interaction between individuals, teams, divisions, departments, and subgroups through attitudes, habits, and behaviors. All three must be considered before developing training curricula (Juechter et al., 1998).

Resistance to organizational trainings varies between types of trainings. Organizational trainings are categorized based on types and magnitude: developmental, transitional, and transformational (Ackerman, 1986). Developmental trainings implemented to improve the current way of operating by doing more improving on the current process. Transitional trainings are the implementation of a new state, which requires the dismantling, or rearranging of the old operating methods. Transformational trainings are profound and traumatic. Transformational trainings produce a future state that is unknown until it evolves. The present organization resists, reacts, contorts, and struggles until it breaks down into the new process and often destroying much or all of the old process. This is assuming that resistance from employees does not overwhelm the intended trainings (Ackerman, 1986). Three questions reflecting the "why and how" which leads to potential for resistance are:

- Do employees feel like victims of a system in which they have no stake, input or control? Or do they feel like meaningful participants in the organization's strategic direction?
- Do they fear training as just or another hassle that means more work or do they embrace training from a sense of ownership with full understanding of the implications for their personal and professional lives?
- Do they feel entitled to certain benefits and advancement or do they measure their performance and manage their expectations based on outcomes? (Juechter et al., 1998)

Another factor in resistance to training is the type of employees that make up the training classes. Kelly (1998) has developed five categories of employees which relate to training in corporations:

1. Sheep: Passive, uncritical, lack initiative and a sense of responsibility
2. Yes People: livelier than sheep, but still un-enterprising and dependent on leadership.
3. Alienated: Critical and independent in their thinking, but passive in conducting their corporate role.
4. Survivor: Employees who survive training by blending in to new conditions
5. Effective/exemplary: Learners who conduct themselves and their conduct and duties with energy and efficiency. (Kelly, 1998)

It is crucial to recognize the different types of learners because each one responds to resistance very differently.

Many organizations overemphasize control and rules. Cultural corporate success depends on the following: fluidity, openness, learning, and a pervasive capacity to make major structural training(McLagan, 2002). General Electric has implemented trainings in their corporate culture by creating a "boundary-less" state where "Everyone has access to the same information and there are no artificial barriers to keep training away" (Steinburg, 1992)." Innovations to deal with training are often met with resistance from both management and employees. Training is one manifestation of innovation that consistently must deal with training. Corporate culture must be flexible and adaptive to accept training in the form of training regardless of how the instructional delivery occurs (McLagan, 1989).

It is unfortunate that much organization-wide training occurs as a result of corporate calamity. Training often begins after a critical loss of profit, a series of employee layoffs, and even the threat of bankruptcy. Training should be an ongoing process and condition of daily life for management and employees (McLagan, 2002). Connor (1994) defines three levels of training in corporate culture that must be addressed to be successful:

- Micro Training-the trainings that people face in their personal lives
- Organizational Training-those trainings in any institution that influence people's lives
- Macro Training-significant trainings that effect people universally (i.e., deterioration of the ozone layer)

Company Leadership

Executive actions have the potential to create resistance to training throughout the company. Executives must decide how committed they are to a training process. If they are uncertain, anxiety may lead them to resist or sabotage the training process by clamping control and changing newly established tool or structures (Ackerman, 1986). To avoid resistance, executives must give confidence toward how training will support a future organizational state that will meet long term goals, delineate how continuous quality service will be provided to the customer as a result of training, orchestrate all the necessary trainings in the proper time frame, and focus on the human elements directly through manifestations of anxiety, resistance, or excitement (Ackerman, 1986). Executives must ask the following questions:

- How is training affecting employee and organizational productivity?
- How is training tied to our business strategies and how is that link helping achieve the organization's goals?
- How do learning and performance initiatives improve our bottom line? (Development., 2001).

Ackerman (1986) outlines steps necessary for effective training processes:

- Ensure employee understanding and acceptance of the need for training and the opportunities provided by the training
- Assess the situation
- Design the desired state
- Analyze the impact of training

- Organize and plan the training
- Implement the training
- Formalize the new step
- Evaluate the training process
- Monitor and fine-tune the training process

Charles Smith states that another form of resistance occurs in language (Steinburg, 1992). Mr. Smith suggests "There is a lot of charged language referring to training. Such words as future shock, targets, and agents add a dimension that is more contentious than what actually happens in a training situation. There's no question that when you get into the training process you'll have resistance. You have to manage resistance but that isn't what is going to help you achieve what you want. You should focus on building on what you want to accomplish rather than on fighting the points of resistance and worrying about future shock, agents, and warriors (p.28) (Steinburg, 1992)."

The research conducted by Linde, Horney, and Koonce (1997) discusses overcoming resistance by recommending several managerial activities. The researchers recommend encouraging employees to accept primary responsibility for professional development. Employers must outline development plans that strike a balance between the current training and meeting long-term skill gaps and performance issues. Managers should not confuse development discussions with performance appraisals. The development plans should be reviewed and updated on a continual basis as a collaborative effort by employee and management. Employees should review career paths and outline how training will develop the employee's value and skills sets. Finally, the authors recommend utilizing training to promote team building (Linde et al., 1997). Morgan (1993) outlines qualities a manager must possess for successful training implementation:

- Identifying and anticipating environmental trends
- Adopting a more entrepreneurial relationship with environment to anticipate emerging problems
- Providing strong leadership
- Supporting the development of knowledge and creative potential at all organizational levels
- Understanding the relationship between technology, organizational structure, and product
- Being proactive

There are many ways to promote a learning environment within the culture of a corporation. Robinson & Stern (1997) developed six elements toward promoting a corporate culture conducive to new initiatives such as training:

1. Alignment: the inclinations and actions of all employees to be directed toward organizational goals
2. Self-initiated activity: providing ownership of challenges to individuals and teams to support intrinsic motivation
3. Unofficial activities: promoting actions outside of direct official support
4. Serendipity: supporting the development of unplanned discoveries (example: unexpected customer comments which could lead to improved trainings).

5. Diverse Stimuli: Acquiring new insights on existing activities or creating new activities.
6. Communication: Clear communication at all levels is necessary for the flow of new initiatives

Approaches

The implementation of training represents a chief expenditure for corporations. Training costs in 1996 represented an estimated annual cost of 100 billion dollars (Saks et al., 1996). Training development professionals have tools at their disposal such as reengineering, total quality management, agile strategies, virtual corporations, benchmarking, delayering, and flattening hierarchies (Roffe, 1999). Unfortunately, millions of dollars are wasted by corporations because of poor choices in approaching training and training initiatives to employees. Resistance to training often leads to failure in the implementation of training. Kotter (1995) describes the explanations of resistance as poor communication, fear of failure, employee resistance, lack of planning and preparation, a misunderstanding of what training is, and ill prepared employees. When changing corporate culture, (Kotler, 1992) outlines the following approaches:

- Organizational Structure: Redefining formal roles and relationships through trainings in organizational levels, reward systems, reporting requirements, task teams, decision-making authority, chain of command, budgets, and communication.
- Organizational Processes: Interrelationships and workflow trainings usually by utilizing new technologies in addressing production, development and customer relations. Process training examples include Total Quality Management (TQM), the 14 points of Deming, and the seven criteria for the Malcolm Baldrige National Quality Award.
- Humanistic Approaches: Changing the organization with the central belief that people are the key to organizational training. This is often implemented by creating a congruency between employee and organizational goals.
- Political Approach: Changing the culture under the assumption that power and scare resources are competing with forces within the organization.
- General Systems Approach: The universalism perspective that states the entire organization must be subject to training for success. This systemic approach usually emphasizes a set of tools for defining the system, diagnosing the problem, analyzing all the subsystems involved, and creating new solutions to organizational challenges.
- Investment/Strategy/Execution Approach: Driven by competition and adversity, this approach is used to develop strategies based on the analysis of internal and external factors. Overall corporate strategies are developed using internal and external factors. This approach is usually utilized in business practices such as mergers and acquisitions.
- Vision/Values/Cultural Approach: Utilizing visioning to map out the organization's future and develop goals, strategies, training, and processes to support those goals.
- Applied Science Approach: This approach utilizes small, measured, incremental steps down a particular path by solving small problems and emphasizing a "learn while you go" attitude rather than develop an overall goal or vision in the beginning of the process (Kotler, 1992).

One approach in dealing with causes regarding resistance to training is the philosophy of using pain to strategically motivate employees. Crises-driven pain works and may be a necessary tool but it is not enduring to the long term process (Steinburg, 1992). Elaine Biech

states “Training is faster with pain because there is a compelling reason to training. When people are told over and over to quit smoking or lose weight, they don’t do it. After they have a heart attack they change their habits instantly. We have worked with organizations that have had tremendous pain and have made some great gains very quickly. Of course, that all reaches a plateau as soon as the pain stops. Because pain works only temporarily, you have to implement something to keep the momentum and improvements going (p.28) (Steinburg, 1992).” The point is that structural trainings will not produce desired effects on an unprepared learner population (Steinburg, 1992). Conner (1992) coins the term “pain management” which he defines as “Concentrated orchestration of information to lead people to believe that the price for the status quo is significantly higher than the price for transition (p.34).” Conner believes that “(pain management) is what pushes people away from their inertia.”

Conner(1992) also believes in another approach to dealing with resistance called “remedy selling”, which the author describes as “the process of offering remedies to pull people toward a desired state.” The example given is a new computer system designed to increase productivity and production, thus leading to higher performance and recognition. Conner (1992) goes on to describe the third component in the necessity to create an implementation plan. An implementation plan is an excellent way to overcome resistance by designing specific action steps for implementing training. Conner (1992) describes four resistance risks:

1. Need to ensure strong commitment in those sponsoring training
2. Need to bring concerns to the surface and deal appropriately with target resistance
3. Need to orchestrate a fit between the organization’s culture and the implemented training
4. Need to prepare training agents for their task of facilitating the training process

The purpose of this paper was to outline causes of resistance among learners. There are more causes that require continued research and understanding. Recognizing these important factors will reduce learner resistance and improve the quality of instructional delivery in schools and businesses. Shared ideas and research with colleagues at AECT will help expand understanding of this significant educational issue.

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HANDHELD COMPUTERS AS SUPPORT FOR K-12 TEACHERS AND ADMINISTRATORS IN THE AGE OF ACCOUNTABILITY

Penelope Walters Swenson
California State University, Bakersfield

Abstract: Increased accountability is part of the K-12 environment. Standards, testing, and other forms of accountability are part of each teacher's daily routine. Administrators often give weekly reports to their superiors on progress toward goals. How can teachers and administrators keep up with the increased demand for documentation in support of accountability? Handheld computers can support teachers and administrators and aid them in being more effective without being another burden.

The accountability movement, exemplified in legislation at the national level in the United States by No Child Left Behind and state-by-state implementation legislation, is not only a phenomenon in the U.S.A. Internationally, standards, assessment, and accountability drive efforts for school improvement.

Teachers, already burdened in many states with large class sizes and high levels of student mobility, feel the crunch of this increased accountability. They ask, "How can we track our students on literally dozens of measures and still have time to teach?" And the statement dozens is accurate at the elementary level. At the secondary level, the number of courses taught by an individual teacher is fewer, yet the numbers of students are far greater. Tracking progress toward proficiencies is a staggering task for teachers.

Administrators at K-12 are feeling the crunch too. In California, and many other states, the progress toward meeting standards is distilled from the literally hundreds of individual measures into one number that is made public and upon which the schools, principals, and teachers are judged. Administrators need data. They must chart and track improvements in each of these individual measures, done typically at their desktop computer. Administrators do not have the time and few have the desire to spend their time tethered to the desktop. Often they feel trapped in the paradox of needing to improve student performance by charting and needing to improve student performance by being in classrooms.

Teachers and administrators are changing the way they do business. They are changing how they view measurement. They are changing what is taught and how it is assessed. Teachers and principals need assessment tools that are easy to use and readily accessible for short and long-term accountability. They need powerful statistical programs on their desktops and they need assessment and accountability tools in the palm of their hands. Many teachers and administrators are turning to handheld computers for this assistance and support.

Handheld computers can maintain records on students, records including test results and progress toward meeting benchmarks regarding individual standards. Having this information readily available is more than convenient; it is necessary. Using handheld computers, teachers can operate from a position of knowledge about individual students, grouping to re-teach specific areas, moving a proficient student on to the next level, providing extra help for a struggling student, and designing strategies for meeting the next round of standards. The information necessary to make these decisions is, quite literally, in the palm of their hand.

In this high stakes testing and accountability environment, individual teachers need data. Grade or subject level meetings are more targeted and enriched by the ability to chart progress toward standards. Additionally, as the charting is being done collaboratively, the teachers have opportunities to share successful strategies and collaborate on how to meet student needs.

Consider the following scenario: Dr. Althea Wright, the principal of Wantara Elementary School, meets with the six teachers of the third grade. They have selected three benchmarks toward meeting standards for the first two weeks of school. They are emphasizing one standard each, for the first quarter of the year, in math, writing, and reading.

Althea Wright notes that she has taken the benchmarks and the rubrics the teachers developed and entered them into a standards program that has a desktop component. She quickly shows the teachers how the program works and how the material can be uploaded to the desktop. The teachers have participated in two sessions of Palm OS handheld 'bootcamp' training, so they understand the basic functions of the handheld computer.

Dr. Wright shows the rubric function and how each student can be scored on his or her progress toward the benchmark. The easy input is done by a touch of the stylus. Students are arrayed by either name or by the benchmark to be met. Exercises are scored using the rubric on the handheld as often as is appropriate. The data is carried within the handheld and uploaded to the desktop through synchronizing on a daily basis. Charts are available on the desktop to graphically show progress or the lack thereof and can be imported into spreadsheet, database, or other desktop application for further manipulation.

Teachers ask questions and begin to look at the rubrics. Two or three suggestions are made to improve the rubrics that the teachers themselves created during the spring. Althea does the additions, then asks the teachers to accept the beamed material for the first two weeks. She transmits, or beams, the information to the first teacher through the handheld computer's infrared port. Each receives it and some pass it on.

At the end of the first two weeks, there is a substantial amount of data. Dr. Wright and the six teachers meet to discuss the data and plan for the next two weeks of data collection. The six collaborate and appoint one of their number to be grade level

spokesperson regarding data and improvement. This group is on track for charting and teaching their way into improved student learning, if one agrees with Mike Schmoker (1999, 2001) that improved student learning can come from using data to drive instruction.

Back at Wantara, Dr. Wright and the grade level team design bi-weekly progress toward benchmark reports to involve parents in the quest to improve student learning and achievement. They find this useful as an increasing number of parents ask for materials to assist their students at home, despite the fact that this is a school judged under-performing the year before.

Students see the teachers as they move about and record progress. They may even receive progress reports via the handheld computer to a printer with an infrared port. This increased recording and reporting may promote increased interest on the part of the students in their own progress.

Certainly, the handheld computer does not drive school improvement. It is only a useful tool as teachers and administrators move from benchmark to benchmark, encouraging and supporting student learning. The handheld functions as a personal data bubble. Grades, rubrics, state and local standards, benchmarks, and student progress are loaded in and available. Progress is noted "on the fly" as students work in groups or make presentations. The teacher is able to enter data once, display and even interpret it using software on the handheld and desktop computer and even use it in word processing programs, spreadsheets, and databases, all without having to re-enter that data. Ultimately the entire data set can be downloaded to a PC and archived or warehoused for future reference.

The teachers and administrators at schools like Wantara are using the handheld computers for a myriad of other tasks. The teacher directing intra-murals uses it for scheduling games. Several teachers have loaded a Spanish conversational program and dictionary on as the need for using a little Spanish is increasing. Most of the teachers are using date book and address book functions. Some are using the handhelds to carry e-books. Another group is using the handheld to keep book inventories and checkout lists. Some administrators are beaming the agendas of upcoming meetings to the teachers for additions and just to have at the ready. Meeting minutes are beamed to interested staff immediately after meetings.

Many school uses are developing on these powerful, low cost handheld computers. Comfortable keyboards are a peripheral added by some. Software applications, from free to moderately priced, are appearing almost daily. These powerful handheld computers are highly available and versatile. They can make the seemingly daunting tasks of standards, assessment, and accountability less daunting for teachers and administrators.

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